MAY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION AND THE DENTAL COSMOS

Seasonal Incidence of Dental Caries—*Erpf*
Facial Injuries—*Gingrass*
Pulp Tester and Oral Lesions—*Kaletsky*
Radiodontia—*Simpson*
Root-Canal Treatment—*Gerlach*
Centric Relation—*Furnas*
Lymphosarcoma of Jaws—*Christiansen*
Periodontal Diseases—*Spalding*
Effects of Thumb-Sucking—*Swinehart*
Osteomas and Cementomas—*Thoma*
Nitrous Oxide-Oxygen—*McCarthy*
Anterior Fixed Replacement—*Schilke*
Examination of Pulpless Teeth—*Grossman*
Temporary Fillings—*Bodecker*

Editorial Department
Pain and Its Prevention
A "Humane Pound Law" Proposed in California

Council on Dental Therapeutics

Association Activities

Bureau of Public Relations

Dental Economics

CONTENTS

Robert L. Dement, D.D.S. ..... Frontispiece

ORIGINAL COMMUNICATIONS

Dental Caries and Paradental Disturbances. II. The Seasonal Incidence of Dental Caries.
Stanley F. Erpf, B.S., D.D.S., M.S. 681

Early Management of Facial Injuries.
R. P. Gingrass, M.D., D.D.S. 693

The Pulp Tester in the Conservative Management of Oral Surgical Lesions.
Theodore Kaletsky, D.D.S. 700

Radiodontia in Children's Dentistry.
Clarence O. Simpson, M.D., D.D.S. 707

Root-Canal Treatment for Deciduous Teeth.
Elsie Gerlach, D.D.S. 711

Centric Relation in Full Denture Construction.
I. Lester Furnas, D.D.S. 718

Lymphosarcoma of the Jaws and Palate.
George W. Christiansen, A.B., D.D.S., M.S. 728

The Etiology of Periodontal Diseases.
Grace Rogers Spalding, D.D.S. 730

Structural and Nervous Effects of Thumb-Sucking.
Earl W. Swinehart, D.D.S. 736

Congenital Absence of Deciduous and Permanent Teeth.
Dell S. Gray, D.D.S. 748

Central Osteomas and Cementomas: Diagnosis and Treatment.
Kurt H. Thoma, D.M.D. 750

The Frenum Labii Superioris.
Enayat Shirazy, D.D.S. 761

Better Nitrous Oxide-Oxygen Anesthesia.
K. C. McCarthy, M.D. 763

A Consideration of the Anterior Fixed Replacement; Suggesting a Simplified Method of Making Direct Pinlay Abutments.
Walter A. Schilke, D.D.S. 765

Bacteriologic Examination of Pulpless Teeth Before Filling Root Canals.
Louis I. Grossman, D.D.S., Dr. med. dent. 774

Histologic Evidence of the Benefits of Temporary Fillings and the Successful Pulp Capping of Deciduous Teeth.
Charles F. Bodecker, D.D.S. 777

The Dentist and Modern Concepts of Heart Disease.
Morris M. Weiss, M.D. 789

EDITORIAL DEPARTMENT

Pain and Its Prevention.—May Day–Child Health Day.—A "Humane Pound Law" Proposed in California 792, 794, 795

Obituaries: William S. Davenport.—Alfred C. Fones.—Charles F. Ash 797, 798, 800

COUNCIL ON DENTAL THERAPEUTICS

Denture Rebasing Materials Containing Acetone.—Accepted Dental Remedies 803, 804

ASSOCIATION ACTIVITIES

Committee on Legislation.—National Board of Dental Examiners.—1937 Membership Record.—Hotel Reservations for St. Louis 806, 807, 809

BUREAU OF PUBLIC RELATIONS

Dental Health Education for American Youth. Harriet Fitzgerald, A.B. 812

Progress of the Oral Health Program in the Schools of Kansas. Leon R. Kramer, D.D.S. 814

DENTAL ECONOMICS

A Study of Dental Care in Detroit, Mich. Rollo H. Britten 821

Practice in Paragraphs 827

INCIDENTS OF PRACTICE

Acute Lymphatic Leukemia. Franz Wilhelm Stumpf, D.D.S., and Dan Woodbridge Daggett, D.D.S., A.B. 828

Hereditary Aplasia of the Enamel. J. J. Olson, B.S., D.D.S. 830

Ischemia of Face Following Injection into Pterygopalatine Canal. Robert H. Mowry, D.D.S. 831

Root Resorption. Jules Abbott, D.D.S. 832

Current Literature 833

Bibliographical 839

Announcements.—U. S. Patents Applicable or Pertaining to Dentistry 841, 843

ADVERTISEMENTS

Index to Advertisements A-55

Classified Section A-46

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THE JOURNAL *of the*
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DENTAL CARIES AND PARADENTAL DISTURBANCES. II. THE SEASONAL INCIDENCE OF DENTAL CARIES*

By STANLEY F. ERPF, B.S., D.D.S., M.S., San Francisco, Calif.

NO problem has attracted more widespread interest within the ranks of the dental profession from an aspect of profundity of research than that of the etiology and prevention of dental caries. Certain facts in connection with this insidious dental lesion have been irrevocably established, it is true. However, the solutions which have been thus far offered concerning the essential causative factors of this symptom (disease?) and the means employed in its treatment are by no means effectual to an extent that can be termed satisfactory in a practical sense. Several schools of thought have arisen, and many of the reports in the literature are widely divergent and conflicting. The differences and contradictions occurring in the articles of reliable investigators prove that the situation is a complex one indeed. It is regrettable that these discrepancies must occur, but eventually when the present knowledge is correlated and supplemented by additional research, much light should be shed upon the current dilemma. Perhaps later, by a process of cancellation, certain unessential variables impertinent to the formula for the maintenance of caries-free teeth can be deleted and we shall know the condition or combination of conditions actually responsible.

The purpose of this paper, then, in view of these existing perplexities, is not to present the "ultimate solution," but rather to point out one of the factors which possibly has been unobtrusively influencing the conclusions of various writers and which thus far has received but

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little of the consideration for which it clamors.

The factor under discussion, namely, that of seasonal variation of dental caries, has its counterpart in many other fields. Its manifestation in various biologic phenomena of both plant and animal kingdoms needs but little explanation. The effect of the warmth, moisture and sunlight of springtime on plant growth and chlorophyll production is understood. The artificial production of these requisites for plant life is accomplished in any garden nursery. Seasonal periodicity in body growth in regard to skeletal increment and body weight has been demonstrated by many investigators. The idea that there is a fluctuation in growth related in some manner to seasonal change has been mentioned from time to time by workers for more than a century, but it has gained widespread recognition only during the last few decades.

Malling-Hanson,[1] in his classical work (1877-1887), revealed a definite seasonal periodicity which he divided into the three groups:

Period of maximal growth, 4½ months, begins in August and concludes in mid-December.

Middle period of mean growth, 4½ months, begins in mid-December, concludes at end of April.

Period of minimal growth, 3 months from the end of April to the end of July.

These conclusions were based on data gathered in Copenhagen, Denmark, and showed changes in the rapidity of growth occurring from season to season. The gains in the maximal period are often two to three times those of the mean or middle period.

Porter,[2] in a study of Boston school children (1909-1919), reported increases in weight of his group during fall and early winter over four times as great as during late winter and spring.

Emerson,[3] in regard to fluctuations of weight in children from 5 to 10 years of age, reported that "variations are commonly observed, the rate of gain being usually greater during the four months when school vacations and favorable climatic conditions permit the nearest approach to good hygienic conditions for children, and when the incidence of acute infection for children is at its lowest." Emerson has also discussed at length the causative factors in growth phenomena. The same appear in brief under five separate headings in the subsequent text.

Variations in the incidence of various diseases have also been noted. Tisdall, Brown and Kelly,[4] in their report on a group of 7,500 children ranging in ages from birth to 13 years, state:

. . . a marked seasonal incidence was noted in only two diseases, tetany and anterior poliomyelitis; these occurred more frequently during the early spring and late summer seasons respectively. Retropharyngeal abscess, nephritis, erysipelas, primary peritonitis and acute appendicitis occurred more frequently in winter and spring months; this is suggestive of an association with infections of the upper respiratory tract. Pyelitis, intussusception and pyloric stenosis on the other hand, were noted more frequently during the summer; this suggests some connection with gastro-intestinal disturbances so prevalent during that period of the year. Whooping cough occurred as frequently in summer as in winter. A slight but definite seasonal preponderance was found with hemorrhagic disease of the new-born, purpura, chicken pox, scarlet fever, measles and asthma.

Hess and Unger[5] have emphasized the marked tendency to rickets during the winter and the appearance of manifestations of rickets in the early spring when the diet is not fortified by antirachitic dietary factors. Articles on the quality of sleep and the variation in calcium content of blood with respect to season have also appeared in the literature.

Skeptical of the deductions of these and other investigators, de Rudder[6] states "... it seems questionable whether accurate meteorological analysis can be accomplished anyway, and also whether the correlation already mentioned and greatly relied upon by the Anglo-American

authors should be accepted . . ." He mentions that the only possible means of proving or disproving the influence of the suspected seasonal factors would be, since the pathogenesis of disease is not as yet clearly established, to observe the fluctuant amplitude of the incidence of disease occurring during the respective seasons of several years and to correlate these observations with climatic variations during the identical seasons of the same period. In passing, it should be stated that de Rudder's point is well taken. The results of the many investigations may not "check" when the difference in meteorologic conditions is the only variable, owing in part to inconstancies in meteorologic conditions in various parts of the world at any given period.

On the basis of the several foregoing reports in addition to other reports in fields related to that of dental caries and possibly affecting the problem either directly or indirectly, the present study was undertaken, with the hope of determining whether the incidence of dental decay likewise varied with the time of the year; whether it followed some biologic law, or whether it was the result of accidental and possibly controllable conditions.

A survey of the international dental literature has disclosed but little regarding the relation of dental caries to seasonal change. Weston A. Price[7] has called attention to the fact that the incidence of dental caries is directly associated with the effect of sunlight on the organism, pointing out that when "cholesterol, a lipoid which is rich in the skin and many of the body tissues, particularly the brain, is exposed to ultraviolet light or sunlight, it has the property of aiding the body in metabolizing calcium." (Bills.[8]) Price also mentions that the caries incidence is indirectly affected by the activating value of the vitamins, this potency being lower in winter than in summer because of the decrease in ultraviolet content of the sunlight. In connection with these two observations on seasonal variation, however, we must emphasize the inadequacy of evidence that this relation is the all important one, since many other factors of undeniable significance undoubtedly enter into a determination of the etiology of the lesion, as will be later pointed out.

As already implied, research in the field of dental caries is beset with such a multitude of variables that it is extremely difficult to disentangle and identify the various combinations of causes and effects. For this reason, as many variables as possible have been recorded and compared in this study in an effort to proceed on as impartial and scientific basis as possible.

For the investigation upon which this report is based, patients were selected at random from the dental student body and the division of dental medicine, in addition to the operative and orthodontic divisions of the University of California College of Dentistry. Observations were conducted methodically over a period of two years (September 1934 to September 1936). Each individual, on acceptance for study,* received a complete medical examination including certain laboratory tests, as, for instance, basal metabolic rate determination, urine analysis and differential blood count. A saliva analysis, to ascertain the calcium and phosphorus content and rate of flow, and, finally, a thorough dental examination, which included the use of roentgenograms, were made. Since the basic problem involved to some extent the food habits, a nutrition history was taken of each patient and an estimate was made of past and present food habits and health record.

Changes occurring over a certain period of time are often of far greater importance than the status at the moment. Reliance may be placed on only a limited number of deductions based on single observations; whereas a great num-

*Physical examination by Saxton Pope, Jr.; nutritional study, Nina Simmonds; laboratory examination, George Williams Hooper Foundation for Medical Research; salivary analysis, William Wainwright.

ber of deductions assume real significance when the results of multiple observations are compared. Herein lies the necessity for regularly repeated examinations; hence, it was decided to make a check-up on the food habits to ascertain whether the suggested changes had been made and adhered to, and to repeat the saliva analyses and dental examinations every four months. Realizing that, in a clinical study of non-institutionalized human beings, strict adherence to Procrustean rigidities is not always possible, it was found necessary to resort in part to graphic methods of recording in order to reduce to a common denominator the values of those examinations which did not fall exactly at the determined intervals.

This method of approach to the problem is one which has not been recognized for its true worth in medical and anthropometric fields until recently. It is a method of *individualization* whereby a relatively limited number of individuals are studied over an extended period during which time systematic tests and measurements are made and all relevant information is gathered. The mode of attack just mentioned is in contrast to the methods of *generalization* in which observations on a large number of individuals are taken in a short period of time, once and for all, and the data thus derived constructed to represent an average curve inadvertently concealing the fluctuations and tendencies revealed by the

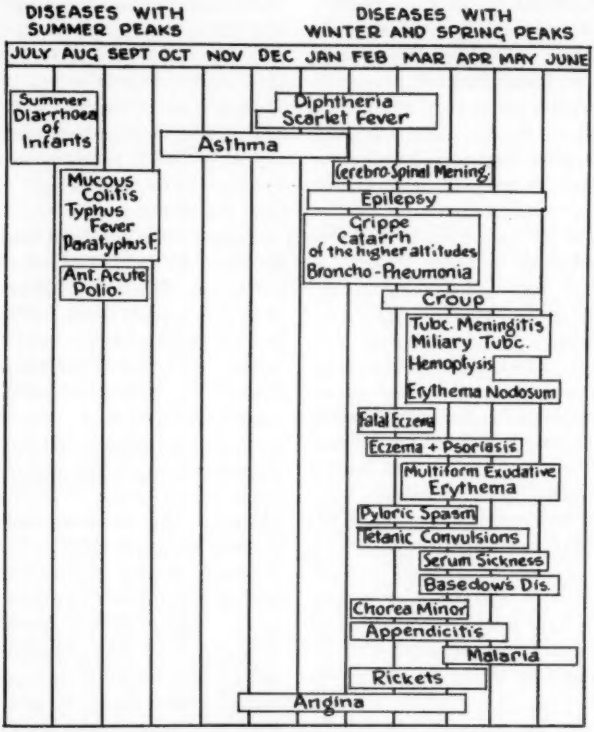

Fig. 1.—Important seasonal diseases. (Translated from de Rudder: Wetter und Jahrezeit als Krankheitsfactoren. Berlin: Julius Springer, 1931.)

personal curve. Generalization in this respect, which has been in use for the most part up to the present time, has not been entirely without responsibility for the confusion regarding the dental lesion under consideration; it is wholly inadequate for a full description of man in the mass. Failure to individualize anything as fluctuant as caries incidence or as diverse in bearing as systemic disease and nutritional deficiency leads invariably to failure to reach accurate conclusions. Even though the data upon which such generalizations are founded be unaffected by experimental error and personal equations, the important results are masked and submerged by a cloud of deductions regarding the mass instead of the individual.

Reference has been made in the foregoing to systemic diseases showing a definite seasonal tide. Computation of statistical data for diseases such as these, particularly those of infectious origin, is a comparatively simple procedure; for it is obvious in a single examination that a patient either does or does not exhibit manifestations of the disease, and the relation of the incidence or occurrence to seasonal change can be determined on the basis of a single observation. As with rickets in this regard, it is a complex problem to determine accurately or even approximately the seasonal variation of dental caries, for it is necessary to distinguish between the *activity* of the process and the *effects* of the process if a reliable investigation is to be conducted. It must be remembered that a study of dental caries is a study of a moving point: at any undetermined time, lesions due to susceptibility to caries may become lesions the result of previous susceptibility to caries. In other words, active lesions and those lesions which must be regarded as "nutritional or systemic scars" (Roberts[14]) must be differentiated. The importance of this differentiation has been overlooked in many reports in which a single group of observations have been carried out *semel in perpetuum* on a great number of individuals considering only the *status presens* of such individuals and utterly ignoring the fleeting values of intensity of the caries process. Obviously, a patient presenting himself for an initial dental examination with a great number of decayed and filled teeth *is* susceptible or *was* previously susceptible to the ravages of decay. Men rich in clinic experience can estimate at a single glance the rapidity of a caries process with a demonstrable degree of success. However, truly scientific research can permit of no such opportunity for the injection of avoidable personal error. Since there is at present no infallible method of measuring caries incidence without the necessity for subsequent examination, it follows that any figure expressing this value on the basis of a single observation only will be founded entirely on personal opinion and is not suitable for reliable deductions. Any method which does not permit the determination of the movement of a fluctuating value in relation to some other comparable value or the movement of a fluctuant value cannot be accepted as thoroughly reliable.

The caries recording system evolved by Charles F. Bodecker[9] was adopted because it permitted a concept of this so-called fourth dimension, i.e., the time factor as it affects acceleration or retardation of the caries process. Since this system is of recent development and must be understood for interpretation of subsequent graphs and tables, a brief explanation of it follows:

Thirty-two may be considered the normal complement of teeth in an adult person. Since each tooth presents on the average five surfaces liable to decay, there are 160 possible areas on which caries may develop. Generally speaking, a count of three is allocated to teeth extracted because of caries. On examination, the areas involved by both caries and dental restorations are counted and this value is referred to a conversion table for reduction to percentage. This percentage, termed the "life caries index," represents the

patient's status at the time of any one particular examination. At any subsequent examination, an increase in the number of areas involved, whether these are filled or unfilled, will be reflected in a change in value of the life caries index. The difference between any two life caries indices is termed the "caries susceptibility index" (C.S.I.), also expressed in percentage. The deciduous teeth, since there are but twenty, require no conversion table, the number of areas affected being expressed directly in percentage.

Caution must be observed, however, in the interpretation of the term "caries susceptibility index" (Bodecker), because its intended meaning may not be clear.

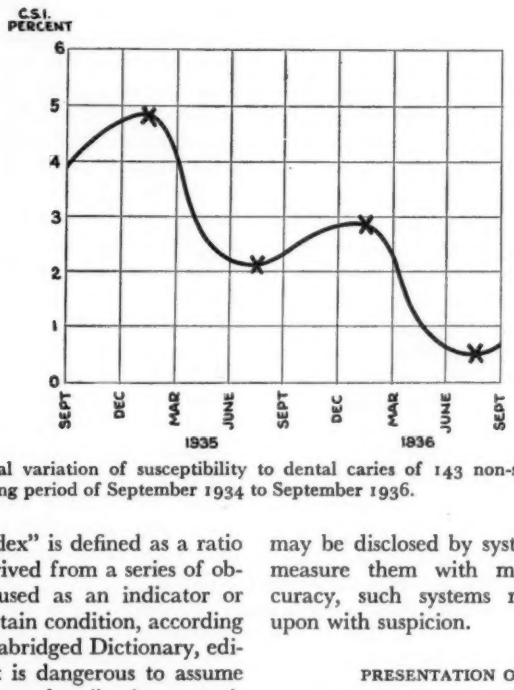

Fig. 2.—Seasonal variation of susceptibility to dental caries of 143 non-selected persons in San Francisco during period of September 1934 to September 1936.

The term "index" is defined as a ratio or a number derived from a series of observations and used as an indicator or measure of a certain condition, according to Webster's Unabridged Dictionary, edition 2, 1934. It is dangerous to assume that an expression such as "caries susceptibility index," which is derived from a measurement of the incidence of caries, can indicate the magnitude of susceptibility to caries.

Biologic processes are not instantaneous: there is always a reaction time between cause and effect to be considered and, in this instance, the lag existing between physiologic change and immunologic effect certainly cannot be ignored. In other words, susceptibility to a disease never begins simultaneously with the appearance of the lesion, but always at some indeterminate time before. Likewise, lesions of a disease may persist for some time after immunity has become established.

Susceptibility and immunity are abstract, constantly fluctuant and tremendously heterogeneous phenomena. Granted that their general tendencies may be disclosed by systems designed to measure them with mathematical accuracy, such systems must be looked upon with suspicion.

PRESENTATION OF DATA

Division of the years into seasons conformed to those mentioned in the reports of Dorno[10] and generally accepted as being correct for northern latitudes. These may be considered as follows:

September 21 to December 21, Fall

December 21 to March 21, Winter
March 21 to June 21, Spring
June 21 to September 21, Summer

Figure 2 illustrates the seasonal fluctuation of caries incidence in our group of 143 patients. The period of highest incidence according to our data occurred during the winter of the year 1934, when the average susceptibility index reached 4.76 per cent. (This figure represents an incidence of over seven cavities per patient annually.) From this point and leading into the summer of 1935, there was a rapid decrease in incidence to the average of 2.28 per cent (3.6 cavities per year). A relatively rapid increase to 2.87 per cent (4.4 cavities per year), which followed this, was observed in midwinter 1935. Another sharp decrease, which culminated in the low ebb, 0.58 per cent (0.9 cavities per year), was noted in the summer months of 1936. The curve terminates as it rises again toward the fall and winter of 1936. A summary of Figure 2 is given in the accompanying table.

The oscillating character of the curve is readily noted, periods of greatest incidence occurring in the winter seasons and periods of least incidence in the summer seasons. With the advent of spring of both years, the curve drops quite rapidly, the decrease being considerably greater than the increase during the respective fall seasons. Noticeable too is the difference in magnitude between the earlier and later portions of the curve, a condition which cannot be explained on the basis of annual climatic variation. The incidence of caries, in other words, has been greater during the first half of the study than during the second half, possibly as a result of the necessary dietary measures and/or systemic treatment instituted on the acceptance of each caries-manifesting patient for study.

Curves were also plotted for the patients individually. Of the eighty-six patients for whom three dental examinations or more had been made, eight, or 12 per cent, remained caries-free throughout the period of study. Of the patients presenting lesions, fifty-eight, or 68 per cent, showed a seasonal variation similar in nature to the general curve. (Fig. 2.) The caries incidence of seventeen patients, or 20 per cent, remained constant, with no manifestation of periodicity. The curve plotted for eleven patients, or 12 per cent, showed a variation which was reciprocal in phase to the average.

SEASONAL FLUCTUATION OF CARIES INCIDENCE: SUMMARY

Season	Caries Susceptibility Index Per Cent	Season	Caries Susceptibility Index Per Cent
Fall 1934	4.36	Fall 1935	2.70
Winter 1934-1935	4.76	Winter 1935-1936	2.87
Spring 1935	2.72	Spring 1936	1.08
Summer 1935	2.28	Summer 1936	0.58

POSSIBLE CAUSES OF SEASONAL FLUCTUATION

The term "season" is a comprehensive one, having a great number of variable factors. It involves *primarily* such extrinsic conditions as weather and climate. There are, however, many artificial variables which occur selectively during certain seasons and which might presumably be responsible for the fluctuation of caries incidence rather than the more strictly seasonal ones.

Emerson[8] has enumerated the following five factors in his discussion of growth, which may also be regarded as sharing in the causation of seasonal tides in caries incidence:

1. "Possible, but as yet undetermined, variation in the functional activity of the endocrine glands, separately or together according to the months of the year." Harrower[11] states that information as to the effect of food supply on the activity of the endocrine system is at present very imperfect. Aub, Bauer and co-workers[12, 13] have demonstrated the close relationship between the endocrine glands and mineral metabolism, particularly in connection with the influence of the former on the latter. Might it not be possible that this reaction is reversible and that seasonal changes in mineral metabolism could be retroactive on the endocrine system?

2. "Social and religious customs and observations such as periods of entertainment, fasting, feasting, and holidays, and educational obligations, such as the period of obligatory school attendance, preparation for examinations, or vacation periods." Under this heading should also be considered, as Roberts[14] has pointed out, factors of exercise and housing conditions. Summer months bring unrestricted hours for play and rest to the child and adolescent after a winter of study and perhaps concern over scholastic standing. The depressing effect of school life has been demonstrated by several investigators. Naturally, because of housing conditions and clothing habits, during winter periods there is less exposure to the sun's rays. Students are necessarily indoors during the very hours that solar energy is most effective. The fact remains, however, that many of our adult patients who were in no way connected with school life exhibited fluctuation in incidence with respect to season; which only calls attention to the inadequacy of evidence to prove the assumption that these variables can be correlated.

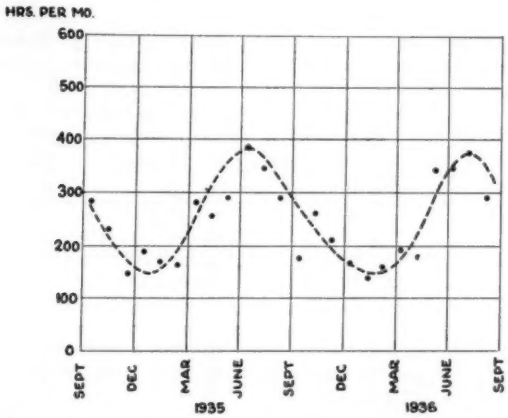

Fig. 3.—Number of hours of sunshine in San Francisco during period of study.

3. "Prevalence of sickness, especially acute infections which in many parts of the world show wide seasonal fluctuations in incidence." It is regrettable that medical examinations of these patients could not have been repeated at the same four-month intervals as the other examinations and some concept of variations in the status of health of our patients be derived therefrom. We have noticed, however, that pulmonary tuberculosis observed in six patients and rickets observed in seven patients were associated with an increase in incidence great enough to be significant. Upper respiratory infections ac-

counted for a noticeable rise in caries incidence. These three diseases are definitely associated with winter and early spring months.

4. "Dietetic changes such as differences in the amount and quality of foods, particularly in those factors known to determine growth." That unsuitability in quality or quantity of food intake is outstanding in the causation of dental caries is a fact now generally accepted. With a restricted income, unless one is an excellent buyer and knows the dietary needs of a family and the dietary properties of foods, it is undoubtedly true that a more unsatisfactory diet will be served throughout the year and where fresh fruits, vegetables and dairy products are available in all seasons and little time elapses during the transportation of produce to the cities. However, seasonal variation in foods might well be considered in regions where heavy rain and snow storms make fresh foods expensive to procure or where foods must be carried long distances; factors certainly not to be ignored, especially when dealing with families of restricted financial income.

5. "Climatic changes, such as those of temperature, humidity and air movement, and of sunlight both in quantity and in quality." Concerning those which may

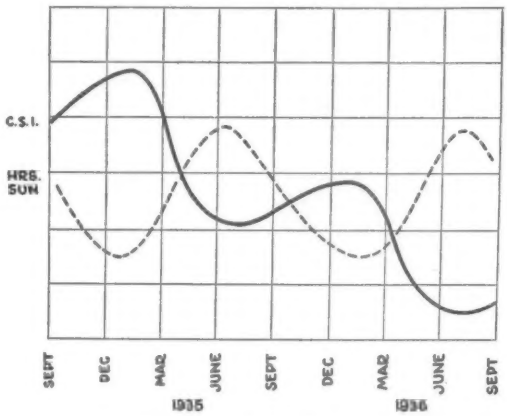

Fig. 4.—"Caries susceptibility index" and "hours of sunshine per month."

than is really necessary. Dietary factors may influence incidence from two aspects in regard to seasonal fluctuation. First, the vitamin content of foods is possibly greater in spring and early summer when such factors as increased sunlight, heat and moisture favor rapid growth of plant life. Secondly, persons are inclined to limit their caloric intake during the summer season and to partake more largely of fruits and vegetables. The latter is not a factor of great importance in the San Francisco Bay region, where the weather is relatively temperate have affected the outcome of this study, we were particularly interested in ultraviolet values and the intensity of the sunlight during the two-year period. Palm[15] states: "The effect of light upon the human organism is obviously more complex than its direct chemical action upon the tissues immediately exposed to it. The exhilaration which we experience in bright weather, and the depression caused by a continuance of dull gray skies must have a corresponding physical change in the nutrition or molecular condition of our nervous centres, and these again react

upon general nutrition." Kimball[16] has reported on the several conditions which alter these values of sunlight from season to season. In 1912, Raczynski[17] wrote: "It is the sun which plays the principal rôle in the etiology of rickets." He gave the first proof of the favorable influence of light on mineral metabolism by an experiment on puppies. One puppy was reared in the dark, the other in sunlight, and both were suckled by the mother. At the end of six weeks, the calcium and the phosphorus in the puppy reared in darkness were very much less than those of the one reared in sunlight. He states: "It is possible to assume that the lack of sunlight, by influencing in so unfavorable a manner the assimilation of calcium oxide in the young organism, is one of the causes of rickets." Tisdall and Brown[18] have demonstrated pronounced increases in the antirachitic effect of sunlight when the maximum daily altitude of the sun is 35 degrees or more. Vitamin D production by ultraviolet irradiation is, of course, one of the three factors in the production of rickets, the other two being calcium and phosphorus metabolism in proper quantity and ratio.

Whether the problem of dental caries is as simple as this is still a debatable subject. Abramson, Hess and Lewis[19] conclude that little if any correlation exists between caries of permanent teeth and rickets. They did find, however, that the deciduous teeth of rachitic children were more predisposed to caries than those of non-rachitic children. Nevertheless, it is generally conceded that a good supply of the sunshine vitamin is necessary for the adequate assimilation of calcium and phosphorus and that it constitutes one valuable prophylactic measure in the retardation of dental caries. Granted that this factor is of importance, the question then presents itself as to whether ultraviolet light in amount sufficient to be effective against rickets is effective to a similar extent against caries. There are incidentally ten weeks of the year in San Francisco when the maximum solar altitude is below the 35 degree minimum mentioned by Tisdall and Brown. It seems likely that if this minimum were

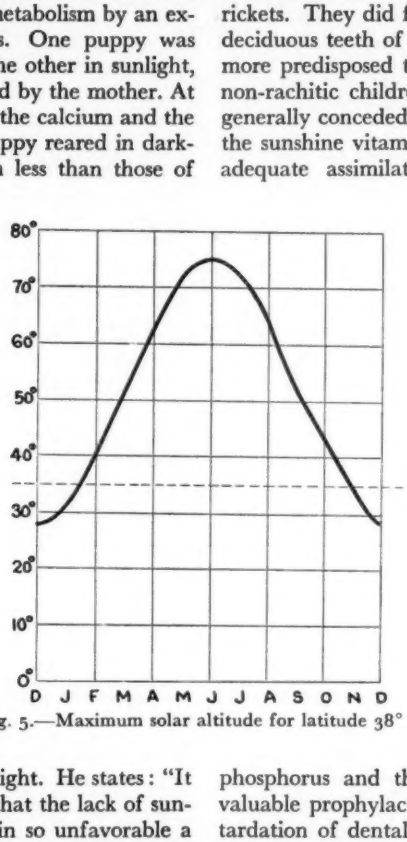

Fig. 5.—Maximum solar altitude for latitude 38° N.

the only factor in a consideration of ultraviolet rays as they affect the problem, the amount of the precursor of vitamin D stored within the body might be adequate to tide the patient over this relatively brief period. Frankly, this raises the question of the ultimate value of climate *alone* and of its being *directly* of great importance. The benefit which the patients of this group may have derived from sunshine during certain seasons did not tide them over owing to the presence of other factors.

Interesting to note, however, is Figure 3, which illustrates the number of hours of sunshine observed in San Francisco during the period of this study.[20] It represents almost the exact inverse phase of the curve on caries incidence shown in Figure 2 and, remarkably enough, conforms even to the corresponding differences of the intervening seasons, being of steeper curve in Spring than in Fall, although the latter is perhaps only coincidental. (Fig. 4.) The curve is based on time factors entirely and represents only the number of hours of sunlight with respect to the time of the year. Actually the number of units of sunlight observed was still more variant because of the increased intensity of the sun's rays during the summer season, a factor greatly affected by the change in maximum solar altitude. In San Francisco, the maximum solar altitude increases from a minimum of approximately 28 degrees on December 21 to a maximum of over 75 on June 21. (Fig. 5; Kimball.[16]) This difference in inclination represents a doubling of the air mass through which the sun's rays must pass before striking the earth. The fact that San Francisco is at sea level also affects the air mass proportionately. A city of the elevation of Denver, Colo., for instance, receives sunlight of considerably greater intensity since fewer rays are filtered out by the earth's atmosphere at an altitude of 5,000 feet. Dorno,[10] in the Swiss Alps, using photoelectric cells, found that the ultraviolet content of the midday sun in July was ten times greater than in January.

Moisture and dust act by raising the specific heat of air and in other ways offer impediment to direct radiation. In this region, unlike the larger industrial centers, smoke is not an important item. San Francisco is, however, noted for heavy fogs, which obscure all direct radiation and constitute an important consideration in an evaluation of ultraviolet content of sunlight. Stallybrass[21] has done excellent work on the seasonal incidence of disease in this connection with regard to prevalence, dispersability and fatality.

COMMENT

It seems fairly evident on the basis of the foregoing observations that caries incidence is not a constant character. As one writer,[14] in a comment on the variant nature of growth, has well expressed it, "It is not a straight line affair, nor is it a smooth curve, but it rises by steps, sometimes by leaps and bounds, at times it is slow, then again it is rapid." It seems apparent, too, that this periodicity follows a regular program with respect to yearly seasons.

It seems incumbent, therefore, to offer some explanation for this fluctuation that might disclose answers to at least some of the questions and theories which present themselves regarding the etiology of dental caries. Is caries incidence affected *directly* by seasonal changes, as, for instance, those differences evident in the ultraviolet content of sunlight from month to month, and season to season as the data presented seem to indicate? Or is there an intermediate governing factor or factors which indirectly bear upon the problem? In this respect, it would be well to recall one of the general biologic rules of Bier as quoted by Petersen[22]: "There is never a single cause for a living event; it is always extraordinarily complicated."

Experimental work with human beings

can never, or at least it would appear so, be so accurately interpreted as work with animals. Not only is there the variable of inherent capacity for health, which is, of course, of tremendous importance, but also there is the fact that persons cannot be confined as it is possible to confine animals. In addition to a great number of other variables, their outdoor activity varies with the period of the year and the time available for leisure, their food varies with financial income and the season, and the assimilation of food is influenced by the effect of their emotional complexes on the digestive system. In other words, would what appears to be a seasonal variation in the incidence of dental caries (and the growth rate of children) disappear if artificial conditions could be stabilized to make constant all of the many suspected causes of dental caries? Or is there something derived from climatic changes and climate itself which is not yet understood? Is seasonal change the common denominator, or some adventitious, unfavorable and possibly controllable factor of disease or environment which operates with greater intensity at certain seasons of the year?

Collection of data will be continued for several years, at the conclusion of which time the results of other phases will be correlated with this study.

CONCLUSIONS

1. There was a marked and regular variation in the incidence of caries observed in a group of 143 patients residing in San Francisco and its surrounding region. This variation was of seasonal nature, showing values almost twice as great during the winter seasons as during the summer seasons of a two-year period.

2. In this temperate latitude (37° 48′ N.), the pronounced fluctuation in intensity of ultraviolet content of sunlight that occurs from season to season is opposite in phase to the fluctuation of caries incidence.

3. Periodicity in caries incidence may not be strictly seasonal but may follow some biologic law as yet undiscovered.

4. In studies of short duration, the problem of seasonal variation of dental caries should receive more attention. It is quite possible that investigators reporting sudden decreases in incidence following dietary correction have been mistaking, in part at least, seasonal fluctuation for the effect of their prophylactic measures.

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EARLY MANAGEMENT OF FACIAL INJURIES

By R. P. GINGRASS, M.D., D.D.S., Milwaukee, Wis.

MOST facial injuries result from automobile accidents and external blows. The high speed of the present-day automobile is responsible for an ever-increasing number of severe facial injuries. Crushing facial injuries are usually complicated by fractures of the skull, cerebral concussion, shock, fractures of other bones, etc.

Sudden arrest of an automobile going at high speed, as in a head-on collision, results in the passenger's being thrown forward against the instrument panel, a severe crushing injury to the face resulting. The upper jaw and malar and nasal bones are more frequently fractured than the mandible in this type of accident. The driver can usually brace himself against the steering wheel, and more often does not suffer so severe an injury as the passenger. Driver injuries are more often fracture of the mandible rather than fracture of the upper jaw.

A blow from the fist usually results in either a nasal or a mandibular fracture. Blows from heavy instruments, such as a crank or a bar, may result in fracture of any of the facial bones.

The skeleton of the face consists of bones, cartilages and teeth blended into a more or less harmonious and functional unit. The soft tissue coverings are factors in producing harmony and function. Any disruption in the continuity of the skin or the framework will, if not properly treated, interfere with appearance and function. Mental and physical suffering often result from not restoring broken bones and cartilages to their former positions and suturing the soft tissues so that scars will be minimized.

The treatment of facial injuries according to well-established principles will result in less scar formation and fewer other deformities. The end-result of an injury is dependent on early and proper care.

PRELIMINARY EXAMINATION AND TREATMENT

Many facial injuries are complicated by shock, head injuries, etc., which demand immediate treatment to save the patient's life. Temporary splints and bandages aid in preventing further injury and add to the patient's comfort. Bandages of the Barton or the four-tail type increase the displacement when applied in fractures of the mandible. Backward pressure on the mandible should be avoided. An efficient yet simple bandage for causing upward pressure on the fractured mandible consists of a surgeon's cap applied snugly to the head and a piece of rubber dam beneath the chin attached on either side to the cap. Thorough cleansing should be carried out, and all embedded grit, dirt and road oil removed if possible. Skin clips and coarse suture materials have no place in the repair of facial wounds. Roentgenograms should not be taken immediately if the general condition of the patient is not good. Careful palpation of the facial bones usually reveals the fracture. An intranasal examination may reveal that the septum is crumpled and deviated. Most fractures of the jaws can be diagnosed by inspection, abnormal mobility, pain on movement and malocclusion of the teeth being important diagnostic points. In a dislocation, the patient is unable to bring any of the teeth into occlusion. In a fracture,

Fig. 1.—Automobile injury. The mandible was fractured at the neck of the left condyle, at the left angle and in the right bicuspid regions. Above: Left: Appearance of patient who was unable to close her mouth, talk or swallow owing to extreme displacement. Skin clips should not be used on the face. Right: Correction of displacement by wiring teeth in occlusion. Below: Left: Left angle, showing comminuted and compound fracture. Retention of the second molar was extremely important. Right: Fracture on right side, involving second bicuspid. There is a small sequestrum in the line of fracture. Extraction of the tooth and removal of the sequestrum are indicated.

some of the teeth are usually in occlusion or can be brought into occlusion by manipulation of the fragments.

SOFT TISSUE REPAIR

After thorough cleansing and the application of an antiseptic to the wound, jagged skin edges should be trimmed to straight lines. Débridement is rarely necessary, as the face has a rich blood supply, and further loss of tissue may complicate a secondary repair. Deep parts of the wound should be built up with ooo chromic gut or fine silk. The skin should be approximated with a subcuticular suture and interrupted sutures. Interrupted sutures should be removed in forty-eight hours, to avoid stitch marks. The subcuticular or tension suture should be removed in about ten days. Trap-door flaps, lacerations with oblique edges and partial or complete severance of portions of the skin, nose or ear require special treatment. Completely severed parts have been returned to their former positions and union has been obtained. Except in very deep lacerations, drainage is usually

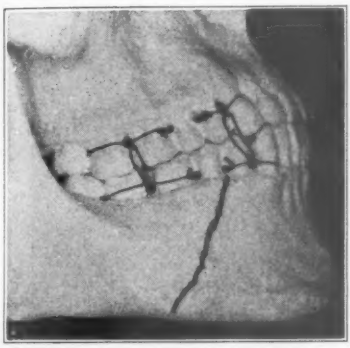


Fig. 2.—Eyelet method of interdental wiring.

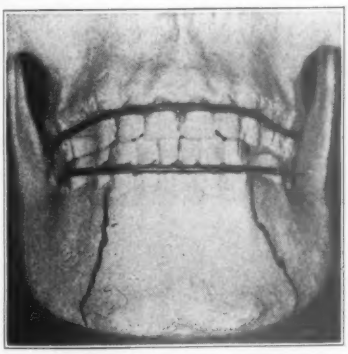


Fig. 3.—Arch bar method of interdental wiring.

Fig. 4.—Driver injury, fracture of mandible. The short fragment (ramus) is drawn upward, the long fragment (body) downward. An impacted molar is in the line of fracture. The case was treated by the arch bar method.

Fig. 5.—Circumferential wiring for fracture of edentulous mandible. Wires were passed around the bone and carried over the vulcanite splint or denture.

not required. Branches of the facial nerve may be cut, but are so minute as to preclude suture. Stenson's duct may be cut, but repair is usually not immediately indicated, as a salivary fistula rarely results.

FRACTURE OF THE MANDIBLE

The mandible is more frequently fractured than any of the other facial bones. This is undoubtedly due to its exposed position, large size and peculiar shape as compared to that of the others. The most frequent site of a single fracture is the bicuspid region. The second site of frequency is the angle. Double fracture usually occurs in the bicuspid region on one side and at the angle of the opposite side. Practically all fractures of the body are compound; *i.e.,* they communicate with the oral cavity because a root of a tooth is in the line of fracture. Fractures of edentulous mandibles are, for obvious reasons, usually not compound. Fractures involving the rami are not compound.

Fig. 6.—Fracture of mandible at symphysis in child 11 months old.

Displacement in mandibular fracture is due to violence and to muscular pull.

Diagnosis is based primarily on the following: malocclusion of the teeth, abnormal mobility, pain on movement and roentgenographic evidence. The roentgenogram is of invaluable aid in determining the lines of fracture, comminution and roots involved. (Fig. 1.) It is of no value in checking the correction of displacement in body fractures. When the occlusion of the teeth has been restored to what it was before the injury, the displaced fragments have been exactly replaced. However, the roentgenogram is of value in determining the degree of correction in fractures of the rami.

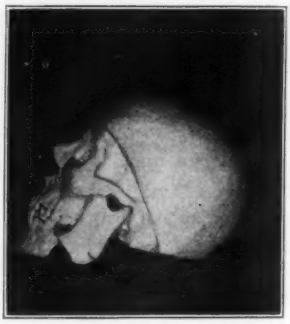


Fig. 7.—Method of controlling short fragment. The wire passes from the angle of the mandible to a hook embedded in a plaster cap.

Fig. 8.—Fracture of alveolar process, left side, extending from midline to first molar. The segment was molded into position and immobolized by an arch bar.

Some men advocate external incision in all compound fractures of the mandible. A more conservative attitude is here advocated, with drainage if infection develops.

As a rule, the patient's condition permitting, in mandibular fracture, the bones should be immediately replaced and immobilized, the tendency to infection, osteomyelitis, etc., being minimized by this procedure.

Ninety per cent of the fractures of the mandible can be cared for by the eyelet and second Gilmer methods. (Figs. 2-3.)

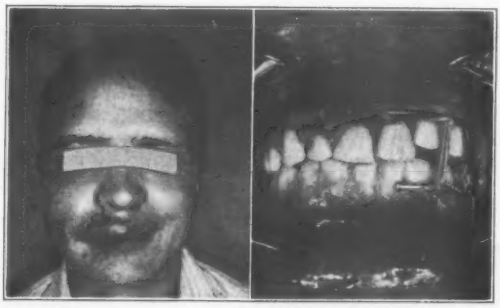


Fig. 9.—Unilateral fracture of right maxilla due to blow from automobile crank. Left: Appearance of patient, showing downward displacement of right half of upper jaw. Right: Arch bars placed on opposite side and elastics used to correct displacement.

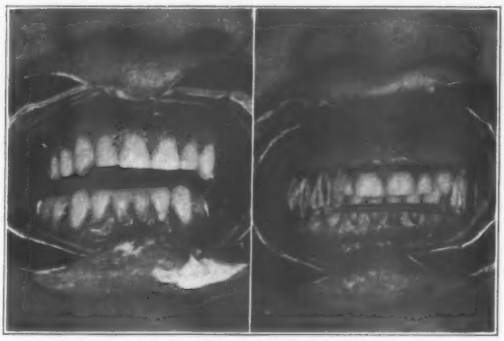


Fig. 10.—Displacement of upper jaw to left, backward and downward, preventing occlusion of teeth. Right: Normal occlusion reestablished by elastic traction.

These methods are quite simple, very efficient and almost universally used.

Teeth in the line of fracture should be retained, at least temporarily.

It is not necessary to extract teeth to feed the patient, as there is sufficient space between the teeth and back of the last molars to permit liquids of high caloric value to pass easily into the mouth cavity proper.

Fractures of the edentulous mandible are usually more difficult to treat, as the absence of teeth precludes interdental wiring. Here, resort must be had to circumferential wiring; *i.e.*, wires passed around the body of the bone and twisted over a splint placed on the dental ridge (Fig. 5), or direct bone wiring.

Fractures of the mandible in children present added difficulties, as the deciduous teeth are usually not sufficient in number and in quality to permit interdental wiring. (Fig. 6.) Occasionally,

resort must be had to circumferential wiring.

FRACTURE OF THE UPPER JAW

Fracture of the upper jaw is usually complicated by fracture of other facial bones, most commonly the nasal and malar bones. It is not possible to tell how many of the facial bones are involved. Roentgenograms are of little value in determining fracture lines in the upper jaw. The clinical examination, consisting of determining the degree of malocclusion of the teeth and the mobility of the jaw, is most important.

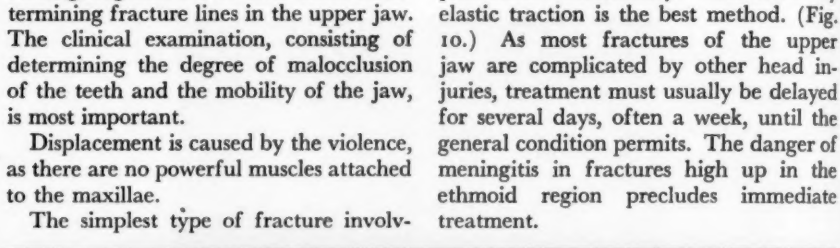
Displacement is caused by the violence, as there are no powerful muscles attached to the maxillae.

The simplest type of fracture involving the upper jaw is a fracture of the teeth and alveolar process. Treatment consists of removing the loose teeth and broken pieces of bone. When several teeth are contained in a block of alveolar process, the mass is molded into position and stabilized. (Fig. 8.)

Unilateral and transverse fracture of the upper jaw involves the nasal cavities and some of the paranasal sinuses, nearly always the antra. The antra usually are filled with blood, which rarely requires removal. We are content to keep the ostia open with ephedrine or a similar preparation. If the blood clot becomes infected, an antrotomy is performed.

Displacement in unilateral fracture is usually downward (Fig. 9); in bilateral or transverse fracture, downward and backward, or downward, backward and laterad. (Fig. 10.)

Rarely is it possible to correct the displacement immediately. Correction by elastic traction is the best method. (Fig. 10.) As most fractures of the upper jaw are complicated by other head injuries, treatment must usually be delayed for several days, often a week, until the general condition permits. The danger of meningitis in fractures high up in the ethmoid region precludes immediate treatment.



A B C D

Fig. 11.—Passenger injury, transverse fracture of upper jaw, nasal bones and mandible, also fracture through midline. Left to right: (A) appearance of patient after injury; (B) displacement, fracture and avulsion of teeth; (C) upward pressure on maxillae obtained by elastic traction from head cap to chin, with arch bars on both jaws; (D) appearance of patient three months later.

When the displacement has been corrected, and it usually will be in from two to five days, the lower jaw may be wired to the upper for a period of about three weeks. After backward or lateral displacement has been corrected, elastic traction against the mandible will correct the downward displacement and restore the correct facial length. (Fig. 11, C.)

FRACTURE OF THE MALAR BONE

The malar bone is usually fractured or separated at its articulation with other

bones. Seldom is the body of the bone fractured.

Displacement, which is usually downward and backward or downward and inward, is caused by direct violence, frequently associated with fracture of the maxillae. Subconjunctival hemorrhage and ecchymosis of the lids are usually marked. Swelling is so great as to mask easily any deformity present.

The diagnosis is made after careful palpation, noting any discrepancies or irregularities in the attachments to other bones. When the bone is displaced downward and inward, there is a depression of the cheek just below the outer canthus and a bulging below this. When it is displaced downward and backward, there is a depression of the outer half of the lower orbital border and a bulging of the zygomatic arch. Anesthesia of the lower lid, upper lip and side of the nose is common, being due to compression of the infra-orbital nerve.

Roentgenograms are an invaluable aid in making the diagnosis.

Fractured malar bones with slight displacement require no treatment. Many methods have been developed for elevating depressed malar bones. When considerable comminution is present, the intramaxillary approach, i.e., cutting a window in the canine fossa and prying the bone outward through the antrum, is a very good method. The method of Gillies, which consists of passing a long flat elevator through a small temporal incision down beneath the bone, is very efficient. While the bone is being elevated, external molding with the fingers aids in repositioning it. When it is once elevated, there is usually no tendency for the displacement to recur. Hemorrhage into the antrum rarely requires treatment.

FRACTURE OF THE NASAL BONES

Nasal injuries may vary from simple lacerations of the skin to severe comminution and crushing of the nasal bones and disorganization of the nasal cartilages. The septum is usually fractured and deviated, and should be straightened when the nasal bones are manipulated.

Lateral deviation can be corrected by finger manipulation, and the correction maintained by a roller bandage for forty-eight hours.

Crushing injuries of the nasal bones are more difficult to manage. Very often, intranasal packing is not sufficient to maintain the comminuted bones in an elevated position. Resort must then be had to external appliances. Metal bars attached to a plastic headcap or to a dental splint will maintain the bones in an elevated position.

The nasal cartilages, if displaced or torn, should be replaced and sutured, if necessary, at the same time.

CONCLUSIONS

1. Automobile accidents are responsible for a great number of severe facial injuries.

2. Lacerations should be sutured so that scars will be minimized.

3. Fractures should be exactly reduced and the bones immobilized.

4. Secondary repair will be necessary in some cases, owing to necessary delay in commencing treatment and to hasty emergency aid.

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THE PULP TESTER IN THE CONSERVATIVE MANAGEMENT OF ORAL SURGICAL LESIONS*

By THEODORE KALETSKY, D.D.S., New York City

THE seriousness of the responsibility in oral surgery is perhaps greater than that of any other specialty in dentistry. The difference between the conservative and the radical management of problems confronting the general practitioner and most other specialists is comparatively slight. For example, in their fields, the extirpation of a pulp or, in extreme cases, the extraction of a tooth would be the most serious and radical procedure. In the field of oral surgery, however, many problems present themselves which require such radical management as the removal of many teeth and their investing structures. Frequently, operations take on such proportions that patients are left with permanent and marked deformities and discomforts. Surely, we have all seen cases of surgical trauma, particularly to the inferior dental nerve, which has caused the patient no little discomfort and suffering. Likewise, large openings into the nasal fossa and antrum have been responsible for more serious complaints than the original symptoms indicated. With this in mind, any measures that might be adopted to minimize these consequences should be most welcome to all concerned. Furthermore, conservatism from the standpoint of prosthesis is also an important consideration.

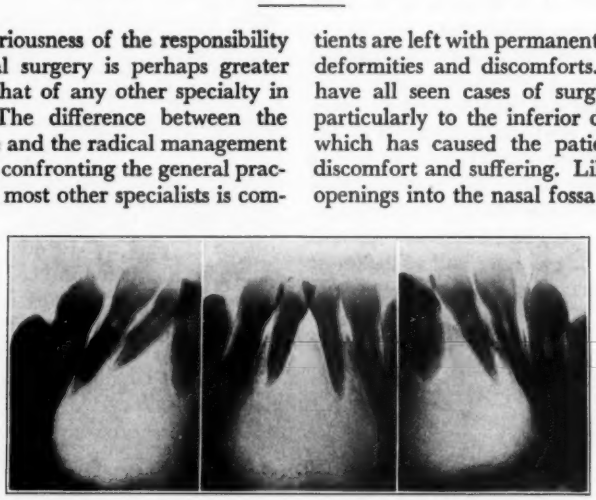

Fig. 1.—Diagnosis: Radicular cyst. A pulp test confirmed this diagnosis and revealed abnormal responses in both central incisors. Root therapy was carried out in these teeth and a conservative Partsch operation was performed.

The dental x-ray film has become a most valuable aid, and even though we all admit its usefulness, we must not overlook the fact that it has its limitations. This is especially true in pathosis in its earliest stages, when changes are not readily discernible on a film. Because the dental pulp is a soft tissue, and also because of its environment, pathosis

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*From the New York Institute of Clinical Oral Pathology.

*Aided by a grant from the American Society of Oral Surgeons and Exodontists.

of the pulp is extremely difficult to diagnose. The roentgenogram will show calcific changes in only certain instances. The other forms of pathosis commonly affecting it cannot thus be detected. Determination of the condition of the pulp is of utmost importance in making a diagnosis. It is also an invaluable aid in prognosis and deciding what therapeutic measures are to be employed. It is frequently not only the chief factor in a differential diagnosis of various lesions that have a similar roentgenographic appearance, but it is also of considerable influence in determining the degree of conservatism that an operator may employ in the management of the problems confronting him. We cannot but believe, in view of the work done in this field and

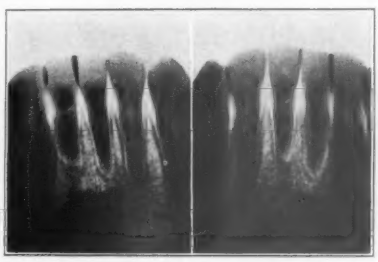

Fig. 2.—Case shown in Figure 1, one year after operation.

also in view of our own experiences, that no examination of the oral cavity is complete without a report of the pulp test findings, along with the other routine measures.

The following are some of the instances in which the pulp test is indispensable.

1. In cases of facial pains arising from inflamed and necrotic pulps, frequently the only means of finding the offending tooth is the pulp test. The importance of this fact is self-evident, especially when we consider how often normal teeth are extracted in an attempt to locate the cause of such a condition.

2. The only way I know of to make a differential diagnosis preoperatively between the radiolucent stage of the cementoma and the so-called apical granuloma is by means of the pulp test. In the case of the cementoma, the pulps are invariably normal and react normally.

3. In the case of the apical granuloma that, according to the roentgenogram, involves several teeth, the pulp test instantly detects the tooth causing the condition and also accurately informs one of the condition of the pulps of the other teeth that appear to be involved. This is of importance, especially in determining what therapeutic measures are to be employed. For, in these cases, regardless of whether the treatment is to be root therapy alone or combined with surgery, only the offending tooth should be treated and the remaining teeth should be left untouched. In due course, this condition will heal and the bone will regenerate without affecting the adjacent teeth which appear to have been involved roentgenographically. The pulp test will at all times accurately determine the condition of the pulps of these teeth postoperatively, and should any become secondarily involved as a result of surgical trauma or for any other reason, such treatment as may then be indicated can be instituted.

4. In the case of cystic conditions, the pulp test is of utmost importance. Here again, it is usually the only means of making a differential diagnosis between a radicular cyst and any other lesion that may appear similar on the roentgenogram, as, for example, a traumatic bone cyst, possibly a follicular cyst, a cystic adamantinoma and, in some instances, even a giant-cell tumor. (See Figs. 1-2.)

From the therapeutic standpoint, the same principle applies in radicular cyst as in granuloma. Only the offending tooth should receive root therapy, the contents of the remaining teeth being left undisturbed. With a conservative operation, the results are most gratifying in comparison with those operations in which more radical procedures are used, and all of the

teeth and surrounding alveolar process are removed, with marked deformity resulting.

volved roentgenographically react normally and, in this instance, the pulps should not be disturbed and the cyst

Fig. 3.—Diagnosis: Traumatic bone cyst. The pulp test findings in all teeth involved were normal. A conservative operation was performed and the contents of the pulp chambers were undisturbed.

Fig. 4.—Case shown in Figure 3; four years later. The teeth still reacted normally to pulp tests and were apparently normal on clinical and roentgenographic examinations.

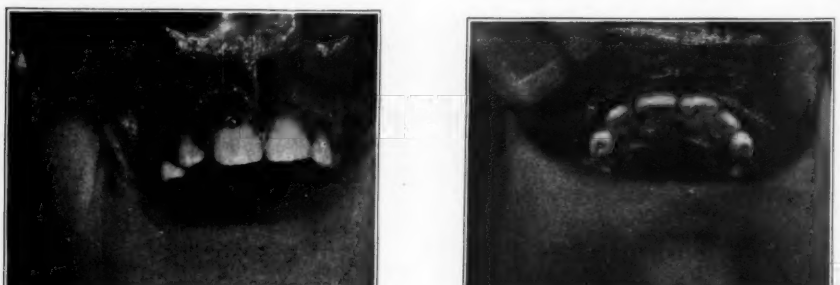

Fig. 5.—Case in white boy, aged 10 years, who developed an acute infection with purulent discharge after oral prophylaxis by his dentist.

In the case of the traumatic bone cyst, all of the teeth that are apparently in-

should be operated on conservatively. The results of such management, particularly

in extremely large lesions, is, to say the least, most beneficial to the patients and most gratifying to the operator; for it is particularly in these cases that invariably radical procedures not only leave the patient with marked discomfort and deformity but also make it necessary for him to employ large, cumbersome and expensive prosthetic appliances for the remainder of his life. In addition to the ordinary discomfort thus imposed on the patient, the psychologic reaction is most unfavorable. (See Figs. 5-10.)

Fig. 6.—Case shown in Figure 5; roentgenograms taken three weeks after the onset; showing marked osteoclasia. In view of the normal pulp test findings, palliative treatment was employed.

Fig. 7.—Case shown in Figures 5-6; four months later. There is almost complete regeneration of investing tissues. All clinical evidence of the disease has disappeared. In this case, the removal of this tooth was recommended by the patient's dentist.

5. In the cases of benign tumors, the teeth embedded therein are normal. This fact may at some time be most significant in making a differential diagnosis.

6. In cases of osteomyelitis, the most conservative measures have been found to assure the best results. The pulp test will here again prove a most invaluable aid. Regardless of the amount of destruction of the bony investment tissues, the pulps usually retain their vitality. The responses may become erratic at times, but with regression of the disease, the teeth will become firm, regain their normal vitality and again function normally. Any tooth that has been an exciting factor in the condition will eventually be detected both roentgenographically and by the pulp test. If the etiologic factor is not within the pulp, all of the teeth will return to normal and remain so clinically and roentgenographically when the disease has regressed. In these conditions, conservative management should prevail even though roentgenographically all of the investing structures appear lost and the teeth appear to be so loose that they might be removed by digital manipulation.

Fig. 8.—Case in white man, aged 35 years, who developed acute exacerbation similar to that in Figure 5, and also following oral prophylaxis. The pulp test findings in this case were normal, and even though conservative management was recommended, the patient's physician insisted on surgical eradication of the condition. The teeth and adjacent soft tissues involved were removed en masse.

7. Another important application of the pulp test is its use in following up cases postoperatively. It is a simple matter to

detect any changes in the pulp whether they indicate tendencies to return to normal or to progress to necrosis. This also applies to teeth that have been traumatized or those that may have become involved secondarily. (See Figs. 11-12.)

8. In the treatment of periodontal disease, I might mention that, regardless of the amount of destruction of the investing structures, the pulps are usually not affected. They become so only in about 2 or 3 per cent of the cases. This fact may

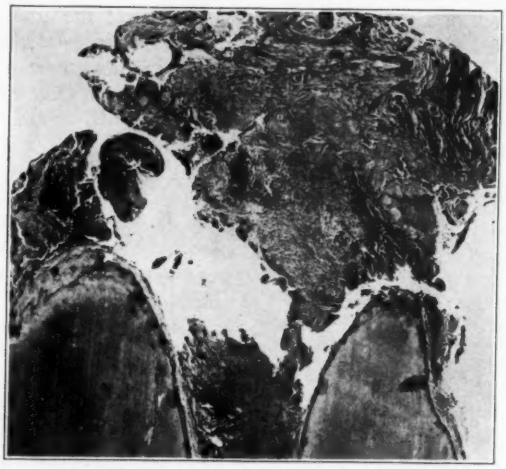

Fig. 9.—Case shown in Figure 8. Survey field showing apices of central and lateral incisors with the diseased periapical tissues in situ.

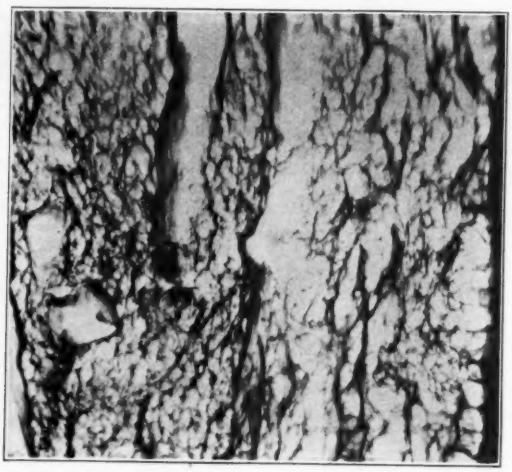

Fig. 10.—Case shown in Figures 8-9. Photomicrograph of dental pulp revealing reticular atrophy, not uncommon in persons of age of patient. This field is typical for the pulps in both teeth.

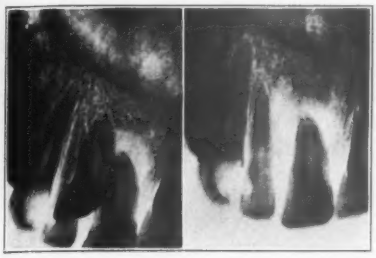

Fig. 11.—Left: Preoperative roentgenogram showing supernumerary incisor in palatal position. At the time of removal of this tooth, the dentist apparently overlooked the osteoclasia in the apical region of the central incisor. Right: Roentgenogram taken one week after operation, at which time pulp test of central incisor revealed definite evidence of vitality. In view of this fact, it was decided that no further treatment be instituted and the tooth be kept under observation.

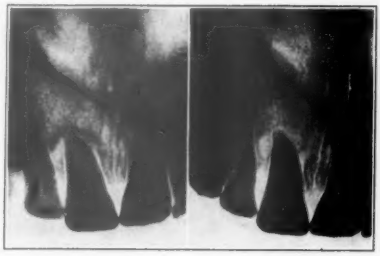

Fig. 12.—Left: Case shown in Figure 11; two months after operation. The pulp test findings were normal. Right: Case shown in Figure 11; three months after operation. The pulp reaction was normal. The investing structures are unquestionably returning to normal, after the etiologic factor, which apparently was the malposed supernumerary tooth, had been removed.

Fig. 13.—Case in white woman, aged 30, showing right side. Resection was performed on both sides of the mandible a few years previously in an attempt to correct a condition of prognathism. Following this operation, there was an anesthesia of the anterior part of the mandible and the lip for about two years, after which the patient noticed a definite tendency toward a return of normal sensation. At the present time, all sensation has completely returned. The pulp test of the teeth in the anterior loose fragment of the mandible revealed a normal response. Even though the inferior dental nerve on both sides had apparently been severed, a definite reestablishment of the nerve supply had taken place. Roentgenographically and clinically, these teeth are normal.

have some significance should one attempt conservative management in the more advanced cases. The question frequently confronts the oral surgeon as to whether these teeth may be regarded as possible foci of infection. I quote from a recent paper with regard to this particular fact[1]:

> If all of the clinical evidence of the disease can be alleviated by various therapeutic measures and the pulp test of the teeth in question is normal, I feel that these teeth while in that condition can always be regarded as healthy. . . . Studies of the pulps were made in an attempt to determine the presence of bacterial invasion, especially in Class III cases. No satisfactory evidence confirming this was disclosed. In fact, in this particular group there was apparently less of bacterial invasion than in some of the other teeth that were considered normal and which had no apparent reason for the presence of bacterial foci.

Fig. 14.—Left side, case shown in Figure 13.

It is hoped that this presentation will, in some small way, stimulate an interest in more conservative management of the problems that are constantly confronting us.

101 East Seventy-Ninth Street.

1. KALETSKY, THEODORE: The Electric Pulp Tester as an Aid in Prognosis and Treatment of Teeth in Periodontal Disease. *The Journal of Periodontology*, Vol. 8, p. 98, July 1937.

RADIODONTIA IN CHILDREN'S DENTISTRY

By Clarence O. Simpson, M.D., D.D.S., St. Louis, Mo.

THE attention which recently has been given to children's dentistry suggests that the need for dental treatment of children was just discovered. Children have always needed more and better dental treatment than they generally have received. Most parents still believe that the deciduous teeth are not important and that a dentist can relieve any serious disturbance which may arise. The enthusiastic missionaries who exhort dentists to care for children's teeth endeavor to make the work attractive by describing the ease of controlling children and treating their teeth. They emphasize the practice-building influence of pedodontia and how it can be made remunerative.

Since dental economics and x-ray machines did not counteract the depression and there has been need for practice building, vacillating dentists decided to feature pedodontia. There has been an epidemic of "junior" operating chairs, "kiddy" furniture and "nursery" decorations. More than an optimistic idea is required to qualify in any exacting task. The dentists who have given children adequate care will continue to do so; the vacillators will drift to something else, and the teeth of most children will still be neglected.

The prospect is no more favorable for the application of radiodontia to children. It is not easy and will be slighted as are other difficult procedures in dentistry. There are too few radiodontic examinations of children, although the requirements can be outlined definitely and the opportunity for service is great. Diet, vitamins and mineral medication have not eliminated dental disorders or the disastrous effects of dental neglect during childhood and youth. Children for whom dental service is sought should have the benefit of preventive and conservative measures which cannot be supplied without radiodontic examinations. Dentists who accept the responsibility of caring for children increase their difficulties by depending solely on clinical evidence. Radiography promotes efficient operations and economy of time and effort.

The primary function of pedodontia is to prevent the premature loss of the deciduous teeth. Prophylactic measures are not always successful, and vigilance must be maintained to discover caries before the teeth are seriously damaged. The occlusal surfaces of deciduous molars are generally less susceptible to caries and easier to explore than are those of permanent teeth. The approximal surfaces of deciduous teeth present the difficult problem of conservation. Although these surfaces are comparatively small, they are difficult to explore. Therefore, caries can penetrate the enamel without being discovered by instruments, after which the dentin is rapidly destroyed and the large pulps soon involved. The precaution to avoid advanced caries and pulp involvement is radiographic examination of children's teeth semi-annually or oftener.

After the eruption of the permanent first molars, an additional risk is presented by the occlusal surfaces of these teeth. It must be emphasized strongly that occlu-

(Read before the Section on Children's Dentistry and Oral Hygiene at the Seventy-Ninth Annual Session of the American Dental Association, Atlantic City, N. J., July 14, 1937.)

sal caries is not always detectable with explorers. Caries may begin at the dentino-enamel juncture of fissures and pits without decalcification or fracture of the enamel. This may occur soon after the first permanent molars emerge and invade the dentin before prophylactic odontotomy is practiced. Also, there is likely to be opposition to the filling of all pits and fissures, many of which may never require it. Regardless of preventive treatment, periodic radiodontic examination should not be ignored.

At the age of 6 years, radiodontic examinations are indicated annually or oftener to observe the progress of dentition. These will determine whether the normal quota of teeth is developing and the presence of any supernumerary teeth. Anomalies of dentition are too prevalent for the assumption that investigation is unnecessary. Many of the serious complications of dentition can be prevented by the early discovery of the contributory factors. A supernumerary tooth can obstruct the eruption of several teeth, and the congenital absence of teeth requires special attention to compensate for the deficiency.

Root resorption of deciduous teeth sometimes does not progress normally and deflects the permanent successors. This condition may indicate the removal of deciduous teeth before they are exfoliated. The presence of erupting bicuspids between the roots of deciduous molars often causes these roots to resorb near the crowns instead of at the apices. When the crown is lost or is removed, the roots fracture and remain at the crest of the alveolar process. The removal of the roots is comparatively easy at this time, but later they are embedded within the developing alveolar process. Retained deciduous roots usually are harmless and their removal is not justified for adults. However, some of them become septic, and it is advisable to eradicate them when the crowns are lost.

The discovery of septic deciduous teeth is an important utility of radiography, as they are a menace to the health of children and interfere with the eruption of the permanent teeth. Although there may be warning symptoms prior to the death of the pulps, the chronic suppuration persists without discomfort. In the painless stage, radiography may be the only means of locating these infectious foci. It is a fallacy to assume that septic deciduous teeth are harmless if there is occasional drainage through a fistulous tract. The discharge of pus occurs only after there is sufficient accumulation to produce pressure, and the drainage is never thorough. The pathologic tissue around the septic deciduous teeth obstructs the eruption of the succedaneous teeth and contributes to malocclusion. The premature loss of deciduous teeth is unfortunate, but, when diseased, they should be removed and the space maintained by appliances.

Interproximal examinations with bitewing film packets are the best means of inspecting children's teeth for caries and are especially useful in determining the relation of the crowns of the permanent teeth to the roots of the deciduous teeth. In periapical views, the permanent teeth are projected upon the deciduous teeth in a manner which gives a false impression of their proximity. This is liable to lead to the mistake of removing deciduous teeth a year before their successors will erupt. The angulation for interproximal examinations clearly reveals the amount of root resorption and the progress of eruption.

A radiodontic examination of a child should consist of at least fourteen views. These comprise three views of the upper incisors, one of the lower incisors, one of each cuspid region, one of each molar region and two interproximal views of the posterior teeth. Three views are essential for the upper incisor region to obtain a true conception of dental conditions, as the curve of the arch tends to produce

distortion of the images. For this reason and because of the late eruption, it is necessary to take separate views of the cuspids instead of attempting to include them with the molar region. Occlusal views are necessary for the labiolingual or buccolingual location of unerupted teeth.

The compromise plan of limiting the examination to left and right extra-oral views and large films placed in the occlusal plane with the rays directed through the nose or the chin is quite inadequate. Extra-oral views are useful as accessories, but do not give sufficient information. Intermediate views toward the occlusal plane which are not true occlusal views cannot serve as a substitute for separate views of the arc formed by the incisors and cuspids. There have been too many compromises in dentistry for children, and practicable, effective methods must be applied to discharge the professional obligation.

The angulation for periapical views of children is 5 degrees farther rootwise than the average for adults. The angles are 5 degrees higher for the maxillary regions and 5 degrees lower for the mandibular regions. This is because the teeth have not fully erupted and the alveolar process is not completely developed. It is futile to attempt radiodontic examinations for a child without having some one to hold the head and the film packets. Children do not realize the necessity for cooperation and they do not have the required coordination to maintain immobility or to retain the film packets tightly. With this assistance, considerable persuasion and dexterity are required to place the film packets in the mandibular regions. The technical difficulties can be overcome by rapid, systematic operating, and the benefits provided justify the efforts entailed in thorough service. There is no convincing argument against routine radiodontic examinations of children: the question is whether dentists will utilize this assistance.

DISCUSSION

Leroy M. Ennis, D.D.S., Philadelphia, Pa.: Instead of discussing the comments of Dr. Simpson relative to the application of roentgenologic technic to care of the child, I shall proceed under the assumption that thorough operators will always experiment with any reasonable suggestion until they attain a technic which experience determines to be successful.

Dr. Simpson reached his conclusions by that route, and the experience and scientific foundation upon which he expounds any theory secures our respect beyond thought of argument; but I may observe that however we angulate the apparatus for taking roentgenograms or whatever film we employ or how many depends on the individual mouth under examination and the objective of the clinician. When, with some younger children, we find it difficult or impossible to secure even fair extra-oral views, we devise a procedure omitting that plan, although, in a child, a complete study of the developing teeth and surrounding structures is hardly possible without extra-oral examinations of the molar and premolar areas; and specialists in orthodontia invariably request such roentgenograms. And although it is true that, with some children, both the head and the film packet must be held in place by an assistant, in other cases the child may really assist if it holds a small film packet in the occlusal plane.

These statements indicate merely the necessity of adapting the technic to besetting conditions. The real purpose, the sole purpose, here is to drive home the point made as to the obligation of parents and dentists to attend to the dental care of children from infancy, with even more regular examinations than we advise for adults, the results of these examinations to remain a permanent record of the dentist making them.

This obligation rests not only upon those styling themselves pedodontists, for every practitioner should be as thoroughly

prepared to treat children as he is qualified to treat adults. Anatomy, physiology and pathology cover the infant no less than the octogenarian. With the recognized distinctions familiar to all students, with the progressive or retrogressive tendencies of tissues, teeth, sinuses and other parts of the oral structure understood, the child presents physical and anatomic conditions similar to those of the adult, though on a smaller scale. There are no peculiar dental ministrations to children that the family dentist should not perform; for no thorough practitioner would extract a deciduous tooth without providing maintenance of the space cleared where that attention is indicated, nor would he overlook the possibility of septic conditions among deciduous teeth, nor, in discovering them, fail to treat the condition; and he would depend not alone on either the clinical or the roentgenologic examinations of child or adult.

What dentist will admit that he cannot recognize pathologic conditions in the child, or that he cannot treat them? What dentist concedes that he cannot advise whether the retention of deciduous teeth is the better procedure or aid in determining their too early loss? What dentist will admit a lack of knowledge of anatomy or his ability in prophylaxis by referring a child to another dentist for treatment? Some prefer to escape treating children, but if any dentist lack the knowledge and the ability to treat the child, let him look to his obvious shortcomings and overcome them.

Roentgenology has complemented clinical examination of the child no less than that of the adult, and has demonstrated earlier faults in our technical and clinical procedures. It has enforced on the dentist a minutely thorough study of anatomy and pathology of mankind from infancy to the scriptural three score and ten years. The fundamental principles of angulation are no less constant with the son than with the father; and the scientific, exact roentgenologist who studies his patient has no surer subject in the father than in the son; for, in the realm of roentgenology, we meet conditions presented by the child in the same manner that we meet varying conditions encountered in the parent.

Whether in general practice it be making a complete examination, filling a cavity, fitting a denture or treating a root canal, we study the patient from every angle, search for peculiar formations and for variations in known landmarks and observe nervous reactions, and we then choose a technic and procedure to assure the results desired. This method of exact and orderly planning applies to man, woman and child.

Some dentists, like so many parents in days gone by, may be prone to consider too lightly the loss of deciduous teeth. Nature is taking its course, they hold, and urge removal of the loosening tooth or, often enough, extract it with their own fingers without further examination or treatment and heedless of consequences. That attitude is passing and today every child is urged to protect his teeth from infancy, and everything possible is done to enlist his interest in caring for the deciduous teeth as well as the permanent ones.

We have awakened to the warnings of Rhobotham and other pioneers who cautioned us against the dangers lurking in unattended teeth of children, a warning that far-sighted dentists like Hyatt, Wisan, Pickerill, McCall, Morgan, McBride and hosts of others have heeded; and today we have for children in America the most complete dental clinics in the world: the Rosenwald clinic and the Ward clinic in Chicago; the Eastman clinic in Rochester; the Forsyth clinic in Boston; the Guggenheim clinic in New York, and the numerous other clinics in Philadelphia and other populous centers of the country. These clinics are educating parents to the necessity of tooth protection, as are the oral hygienists and the dentists asso-

ciated with the public and other schools. The current issue of THE JOURNAL confirms the wide activity of public health departments throughout the country in instituting dental health programs that begin with children of school age and earlier. Even the extravagant claims made over the radio for this or that tooth powder or paste are of some value in calling attention to the necessity of brushing the teeth and visiting the dentist regularly.

Prevention, prophylaxis, is the thought uppermost in our minds today, and as Dr. Simpson points out, prophylaxis should start with the child. Our dental schools have, for many years, emphasized the desirability of watching the deciduous molars, the premature loss of which may cause malalinement of the permanent teeth. The advice applies to all deciduous teeth, too early loss or too long retention of which may result in irreparable destruction of a normal occlusion. The caries that contributes to this condition in many cases can be corrected only by early and continuous examinations.

ROOT-CANAL TREATMENT FOR DECIDUOUS TEETH

By ELSIE GERLACH, D.D.S., Chicago, Ill.

PROBABLY no other condition causes the conscientious dentist more anxiety than pulp involvement in deciduous teeth. Forceps may quickly rid him of the worry, but the troublesome problem of space maintenance follows. Or he may adopt the slower method of leaving the tooth alone, and cherish the hope that it will not become a focus of infection. Every dentist and doctor has observed cases in which children apparently remained happy and healthy in spite of a chronic fistula of a deciduous tooth.

To date, very little investigative work has been done to prove or disprove that deciduous teeth with necrotic pulps are a menace to the health of a child. All the theories we have about these teeth have been carried over from the evidence obtained from experimental work on permanent teeth. In reviewing articles in medical and dental literature concerning oral infections of children, we find many of the cases cited to be in adults, especially the middle-aged. Yet those of us who daily work for children have noted that conditions of the pulp in deciduous and permanent teeth vary in many respects. The acuteness of the process of pulp degeneration in the deciduous tooth and the formation of a fistula are probably the most striking differences.

It cannot be denied that a pulpless deciduous tooth may act as a focus of infection; but clinical experience has led pedodontists to believe that many of these teeth can be restored to usefulness by proper therapeutic procedures. Let us briefly consider the value of saving such a deciduous tooth.

If we consider mastication the prime function of the denture, we must aim to keep it intact. The loss of but one tooth will impair chewing. Food improperly prepared in the mouth is poorly digested. This affects the assimilation of the substances necessary for growth and development of the body. Broadbent, Todd and

(Read before the Section on Children's Dentistry and Oral Hygiene at the Seventy-Ninth Annual Session of the American Dental Association, Atlantic City, N. J., July 14, 1937.)

Schour have shown that when metabolism is altered, growth is interfered with. These subclinical conditions cause a persistent lagging behind the normal.

In addition to the general effect on growth, loss of a deciduous tooth has an immediate effect on the development of the denture. When a child has one tooth missing or has a sore tooth owing to periapical infection, he is very apt to confine his chewing to the unaffected side of the jaw. This establishes a habit of unilateral mastication which may persist over a long period of time, resulting in retarded growth on the other side because of lack of stimulation. If both sides are involved, the habit of indifferent mastication causes underdevelopment of the jaws.

In the normally developed jaw, each tooth supports the other and the forces of occlusion are transmitted through their contact points. If a tooth is lost, these contact points lose their support and the integrity of the arch is broken. The tooth distal to the space tips mesially and lingually, if in the molar region, and shortening of the space results. Dense scar tissue forms in the place of the extracted tooth, and the eruption of the permanent tooth is thus delayed. As the succeeding permanent tooth cannot erupt into its normal position, it is forced lingually or buccally or into a rotated position. Closing of the bite may also occur. Thus, the early loss of a deciduous tooth often results in a need for orthodontic treatment a few years later. Even a properly made space-maintainer does not always assure the desired results. In the mouth of a careless patient, it is easily broken, becoming a source of annoyance and expense to patient, parent and dentist.

Before treatment of the pulpless tooth is undertaken, several facts must be considered. A child who has shown that he has a low resistance to disease is not a good subject. At least, the physician in charge of the child should first be consulted.

Root-canal treatment for deciduous teeth should never be undertaken until a clear roentgenogram of the tooth and its surrounding tissues is available. A good roentgenogram may reveal conditions which contraindicate treatment. Rapid resorption of roots sometimes occurs at 4 or 5 years, if there has been an acute periapical disturbance. There may be no other indication of this resorption until the roentgenogram reveals the condition. For such a tooth, therapy would result in failure. On the other hand, there may be a rapid physiologic resorption of the roots, resulting in early eruption of the permanent teeth. Bicuspids sometimes erupt at 8 or 9 years of age. Or the permanent successor to a deciduous tooth may be missing, in which case it becomes important to save the deciduous tooth.

Unsuspected pathologic conditions will also be made apparent by a good roentgenogram. The floor of the pulp chamber may be weakened by extension of decay into this region. This process so weakens the structure that filling would fracture the tooth.

The roentgenogram may show an area of bone destruction between the divisions of the roots. Usually, in such cases, there is a fistulous opening into the gingival trough. These cases are not amenable to treatment.

We all have learned that, when working with small children, we must concentrate on the child in order to hold his attention over the period of time necessary to complete the work. Therefore, it becomes imperative to make every movement count so that the work can be completed as quickly as possible. In order to accomplish this, definite procedures must be established. We should have a clear idea of what is to be accomplished at each sitting. Every possible event should be foreseen and plans laid to deal with whatever situation may arise. Turning from the chair to look for a misplaced instrument may so distract the child's attention that much time will be lost in regaining

it. All instruments and material needed throughout the operation should be placed in easy reach. This is important when the dentist works without an assistant.

Keeping the field dry and sterile becomes a game of skill and speed. A cotton roll can be kept in place with a cotton roll holder in the lower jaw; but in the upper jaw, one must learn to hold the cotton roll with a finger. It takes a little practice to slip a dry cotton roll in and a wet one out without disturbing the whole field. Adding a saliva ejector complicates matters, but has the advantage of forcing the child to keep his mouth open. If you have the confidence of the child, he may allow you to apply the rubber dam. From actual experience, I can assure you that the work can be accomplished more quickly when the dam is used. Not only does it keep the tooth dry, but the tongue is held away from the field of operation and the taste of the medicament from the tongue. Most children resent an unaccustomed taste and react in such a way as to cause the dentist to lose time and patience.

With a few variations, the technic for root-canal treatment for deciduous teeth is the same as for permanent teeth. Care should be exercised to keep the field sterilized and to use only sterile instruments and supplies. The pulp should be completely removed from the pulp chamber and as much as possible be removed from the canals. The danger of going through the apex of a root canal of a deciduous tooth is very slight, except in the case of a very young child. Most of the canals in the roots of deciduous teeth are so narrow that it is difficult to enter them with the finest broaches. From a good roentgenogram, we can judge the length of the canals and thus avoid going through the apex; but whenever there is periapical involvement, it is necessary to clean the canals all the way through so that drainage can take place through the canals.

In a case of vital exposed pulp, pressure anesthesia is the most practical type. The cavity should be carefully cleaned of débris and loose dentin with spoon-shaped excavators, extreme care being observed not to touch the exposed pulp. A pellet of procaine is placed directly over the exposed area and a drop of sterile physiologic solution of sodium chloride immediately dissolves the procaine. A small piece of unvulcanized rubber is carefully packed in the cavity and pressure applied with an amalgam plugger. This pressure is exerted directly over the area of exposure, where it is most effective, and not on the sides of the cavity. The pressure is started gently to avoid pain and gradually increased until the patient no longer complains of discomfort. The pressure should be continuous and not erratic. It requires about five minutes to obtain anesthesia. With a large round bur, the roof of the pulp chamber is quickly opened and enough removed to give easy access to the canals.

When the original exposure to the pulp was small, a second application of procaine may be necessary before the pulp can be removed painlessly from the pulp chamber and canals. The pulp chamber should be freed of pulp and washed out with the sterile saline solution to stop the bleeding before the contents of the canals are taken out. The roentgenogram of the tooth is frequently referred to in order to gage the length of the canals. Sometimes, the roots are resorbed on the surfaces next to the developing permanent tooth and this does not show in the roentgenogram. Consequently, the broach, when inserted in the canal, is carried through the side of the root. This condition does not interfere with the success of the procedure.

The canals, having been freed of pulp and débris, are enlarged with files, first with No. 1, which is the finest, then with 2 and 3, and up to 4. When No. 4 is easily admitted, the canal is large enough

to receive a No. 12 gutta-percha point. Eugenol is sealed in the canals on paper points and the cavity is closed with temporary gutta-percha. Whoever accompanies the child should be instructed as to how to remove the temporary filling if the tooth becomes sore before the next visit. This precaution is necessary whenever there is a possibility of infection.

The patient is dismissed for forty-eight hours. Then, again under sterile conditions, the dressing is removed, and if there is no infection, the canals may be filled, No. 12 gutta-percha points, lubricated with an antiseptic paste, being used. This paste is pumped into the canals with the gutta-percha points used in filling the canal. It should not be forced through the apex. The pulp chamber is filled with temporary stopping and the cavity with a cement. Another roentgenogram is taken to check the root-canal filling.

Partially vital pulps require a somewhat different method of procedure. Very often, the child has had discomfort in the tooth for several days and is apprehensive. This is probably the most trying condition with which a dentist deals. An opening must be made into the tooth. Pressure anesthesia must not be used because of the danger of forcing the infection through the apex. A gentle removal of the débris with hand instruments and frequent rinsing with warm water will aid in gaining access to the pulp chamber. An antiseptic dressing is sealed in with temporary stopping for twenty-four hours, but parents are instructed to remove the filling if the tooth should become sore. At the second visit, if the inflammation has subsided, pressure anesthesia is used and the pulp removed. Another antiseptic dressing is applied for twenty-four hours; or arsenic may be sealed in for forty-eight hours. The canals are then enlarged and a eugenol dressing is sealed in and left for one or two days. Then, if there is no odor or moisture, the canals are filled. Otherwise, the canals are washed out with a chlorine solution and resealed with eugenol. It usually takes not more than three or four visits to complete such a case, and the prognosis is good.

In a deciduous tooth in which the pulp is completely necrotic before the infection spreads to the periapical region, the patient has no discomfort when the canals are cleaned out. If it is the patient's first visit to the dental office, the dentist has an opportunity to do painless work and therefore establish in the child a feeling of confidence. In cleaning out the canals, care should be taken to prevent necrotic material from being pushed through the apex. For a day, the tooth should be left open for drainage. Then the canals are washed out with a chlorine solution, dried and sealed with beechwood creosote and a 3 per cent iodine dressing. Three or four visits are necessary before it is safe to fill the canals.

If the necrotic pulp is neglected, the next stage is a periapical involvement with all its accompaniment of pain and swelling. The time which elapses between a partially vital pulp and an abscess may be very short. The child may become acutely ill from the effects of the toxins. If drainage can be established through the root canals, the swelling and soreness will usually disappear rapidly. For drainage, an opening must be made into the pulp chamber with a large round bur. This cannot be done without pain and the child must suffer for the few moments required to do it. The canals are cleaned out with broaches so that drainage may take place through them. The cavity and canals are washed out with warm antiseptic solution and left open. The parents are instructed in the proper care of the child to reduce the temperature and a diet is prescribed. The child is seen every day until the swelling subsides and the pain is gone. If the physical condition is good, the canals may be treated and filled. This will require about two weeks.

After several months have elapsed, it is surprising to see this tooth solid in the socket and in a comfortable condition. These young tissues seem to possess surprising recuperative qualities.

The so-called gum boil, which is so frequently found in the soft tissues surrounding a deciduous tooth, is a fistula draining from a chronically infected periapical area. On pressure, a small drop of pus may exude without discomfort to the patient. If a blunt probe is inserted in the fistula, it will be found to lead through the bone, and the crown of the permanent tooth may be felt. This condition will yield to treatment if the tooth is treated through the canals and the fistula. The canals are thoroughly cleaned of débris, and beechwood creosote and 4 per cent iodine are sealed in them. A paper point moistened with these disinfectants is inserted in the fistula, left for a few minutes and then withdrawn. Usually, canals are ready to be filled after four or five treatments.

After root canals are filled, it is advisable to allow two weeks to elapse before a permanent filling is placed in the cavity, to permit sufficient time to elapse for any unfavorable reaction to manifest itself.

All cases should be followed with roentgenographic examination every six months in order to watch the progress of root resorption. Occasionally, one of these treated teeth seems slow in exfoliating. If the corresponding tooth on the opposite side of the same jaw is normal and untreated, it may be wise to remove the retarded tooth at the time the normal one is shed. In children, the teeth are usually lost in pairs.

The question arises: What becomes of the gutta-percha points? As root resorption progresses, the guttapercha points remain in the tissue because they are inert. But, being attached to the gutta-percha in the pulp chamber, they are removed when the crown is lost. If this does not take place, a little probing in the tissues will dislodge them. If there is any doubt, another roentgenogram should be taken. It is advisable to instruct the patient to return to the office when the tooth becomes loose, for proper examination and supervision of the extraction.

Making it possible to retain a deciduous tooth in its normal position and health for as long a time as is necessary for growth and development of the arches should be our goal. The task may be a comparatively easy one if we have the opportunity to see the child patient at an early age. However, if we are not able to give dental aid until the pulp of the tooth is involved, we can and should be ready to give proper treatment when needed. Many times, it is a question of overcoming timidity in managing such cases; but, with some experience and practice, they are not difficult to handle, and a great deal of pride should and must certainly result from their successful management.

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DISCUSSION

Alfred Walker, New York City: Dr. Gerlach has given us a comprehensive outline of the procedure in the treatment of pulp-involved deciduous teeth. Although we neither advise nor practice the treatment of pulp-involved deciduous teeth at the New York College of Dentistry, nor do I practice it in my office, for reasons which I shall set forth in this discussion, I nevertheless wish to compliment Dr. Gerlach on her attempts to solve this vexatious problem.

If we believe that infected permanent teeth may be a menace to health, we can hardly dispute the statement that similar conditions in deciduous teeth may affect the health of the child. In fact, Dr. Gerlach states that "it cannot be denied that a pulpless deciduous tooth may act as a focus of infection." In describing what may happen to the child when deciduous

teeth are prematurely lost, she has given us no exaggerated picture.

With a knowledge of the havoc that may be wrought by the early loss of primary teeth, and of the difficulty of repairing the damage, if indeed the damage is reparable, do not the local problems, rather than broader considerations, often influence our decisions as to treatment? We should never lose sight of the fact that, in every instance, dental service should be instituted in the interests of general health and that, therefore, no operation should be undertaken for the purpose of conserving masticatory or esthetic values if the general well-being of the patient is thus jeopardized.

In pulp-canal therapy, whether applied to the deciduous or the permanent teeth, certain fundamentals must be adhered to. The first question to decide is whether the tooth is savable and, if so, whether it will have a definite value to the patient if saved. In determining whether a tooth is savable, we must first, as Dr. Gerlach has stated, obtain good roentgenograms. I use the plural advisedly because I do not believe that in making a decision as to the disposition of a pulpless tooth, we should rely on a single x-ray picture, unless, of course, a single film discloses a pathologic condition from which a definite diagnosis can be made. It is better to have the tooth roentgenographed from at least three angles in order to disclose conditions which may not be detected in a single film. The condition of the health is always an important consideration, and the possibility of gaining access to the root end is equally important. The facilities for maintaining asepsis throughout the operation are also a first consideration; and the complete filling of the canal with a compact homogeneous filling which completely and permanently seals the apical opening is of the utmost importance.

I wish to place special emphasis on the last item because, in my opinion, it bears very specifically on this question of the advisability of attempting root-canal therapy for deciduous teeth; for regardless of how fully we may be able to comply with other requirements just enumerated, unless we permanently seal the apical ends of the deciduous root canal the operation will fail, since this is the *sine qua non* of successful root-canal therapy.

Regardless of how effectively we may seal the canal of the deciduous tooth at the time of the filling operation, the progressive resorption of the root will eventually bring about changes in the relationship between the filling material and the surrounding wall and result in a condition inviting reinfection.

I yield to no one in my estimation of the importance of retaining deciduous teeth until the normal shedding period, but I do not believe that they should be retained at the risk of the child's health. I realize also that the application of space maintainers for the purpose of offsetting the evils which may follow the early loss of the deciduous teeth presents an economic problem that is not to be denied.

I am assuming that Dr. Gerlach's treatment of pulpless deciduous teeth closely parallels her methods for the treatment of similarly involved permanent teeth. Such being the case, it will be in order to discuss some of the procedures which admittedly apply to both.

The importance of asepsis is mentioned. This, as I stated before, should always be a first consideration; but I question very seriously whether asepsis in pulp-canal therapy can be satisfactorily maintained without the aid of the rubber dam. To assume the attitude that we are justified in resorting to secondary measures because the conditions will not permit the use of this premier means for maintaining asepsis is not compatible with the accepted principles of asepsis.

Dr. Gerlach also advocates leaving teeth open for the purpose of drainage. I must

emphatically disagree with this procedure. The only cases in which such practice is permissible are those in which there are marked swelling and a profuse discharge of pus. Except in these extremes, the discharge from the tooth can be reduced at the chair to the point where temporary sealing of the tooth is possible.

I am well aware of the fact that open drainage is resorted to routinely by some pulp-canal operators, who compare it to drainage as practiced in general surgery. They overlook the fact that the pulpless tooth exists under conditions that differ from conditions elsewhere in the body. In treating pulpless teeth, the departure from surgical principles is of course not permissible, but owing to the specialized nature of pulp-canal therapy, methods of treatment different from those followed in surgery elsewhere may be effectively employed.

Mechanical cleansing of canals assisted by the judicious use of chemicals makes it unnecessary to leave canals open, a practice which usually complicates and prolongs the treatment. Germicides should be sealed in the canal to enable them to fulfil their purpose more effectively.

Dr. Gerlach has rightfully warned us of the danger of forcing infection through the apex. She speaks of an antiseptic paste as a filling material or as an adjunct to the filling material. I hope that in her closing remarks she will announce the formula of such a paste, because, in selecting an antiseptic or germicide, we must bear in mind that they depend for their potency on a definite degree of concentration. In consequence, preparations which are subject to dilution through contact with their surroundings cannot be relied on for permanent effectiveness. Such dilutions of antiseptics or germicides may be brought about in various ways; for example, through contact with body fluids and tissues and through contact with bacteria or their products. These points are of extreme importance when we consider the very small area in which we are operating and the relatively small amount of germicide which may be applied.

A policy based upon what is best for the general health of the child is in the long run the only safe one to follow, until such time as a caries preventive formula is available; and until provision shall be made for complete dental service for all children, we shall continue to be faced with the vexatious problem of the pulp-involved deciduous tooth. However sympathetic we may be, we should not be swayed by our emotions.

My many years of clinical practice and investigation in the field of pulp-canal therapy have convinced me that if basic surgical principles are followed, pulp-canal therapy is a safe procedure, but the very nature of the conditions surrounding the pulpless deciduous tooth precludes adherence to these principles. I do not deny that a treatment procedure which does not violate these principles is a future possibility, however.

I regret that I cannot accept the technic which Dr. Gerlach has brought to us, but I nevertheless commend her for the serious effort she is making and for the careful outline which she has presented in her paper.

CENTRIC RELATION IN FULL DENTURE CONSTRUCTION

By I. Lester Furnas, D.D.S., La Jolla, Calif.

WHEN, in the latter part of the nineteenth century, the dental profession assumed the responsibility of constructing artificial dentures, it took unto itself many problems that at the time were not only unknown, but also little suspected.

At the outset, an efficient impression technic seemed to be the greatest need, a need which was complicated by a lack of suitable impression material. Porcelain teeth had not yet made their appearance, of course, and, even in the early years of their development, they were lacking in color, quality and scientific form. These and many other obstacles were overcome, however, and the members of the profession gradually began to look from the purely mechanical and technical questions to more fundamental problems. It had been early observed that the mandible had a certain functioning position as regards the maxillae, and that dentures were successful only in direct ratio to the exactness or accuracy with which this position was achieved. This step in denture construction technic was called "taking the bite," and, because of the extreme difficulty of accurately recording this position and its tremendous importance to ultimate functional success, it was by far the chief cause of failure and necessitated the making over of more dentures than any other single cause. Investigation and research had revealed the fact that this jaw relation was closely related to, if not actually a part of, the temporomandibular articulation, and therefore much effort was expended in this direction. The attempt made by every early designer of an articulator to imitate this articulation is evidence of this fact. The invariable tendency on the part of every edentulous patient to protrude the mandible in the closing movement, and the establishment of acquired functional positions unnatural to the normal relation, were the chief problems to be overcome; and almost every prosthodontist began to develop ways and means of accomplishing this end. Study of the temporomandibular articulation in dry specimens seemed to indicate that when the condyles are in their most retruded position in the glenoid fossae, the mandible must be in the correct relation, and the technics which followed were developed with that ultimate end in view.

One of the earliest methods employed was to force the mandible back into this relation during the act of closing. This seemed simple enough, but there was no definite means of telling whether the condyles were actually back in the desired position; and, too, the procedure was still further complicated by the resistance of the patient to the necessary pressure. The patient was instructed to open the mouth and the head was held firmly while the jaw was closed by the operator by exerting a steady upward and backward force. The fallacy of this procedure is evident enough without further comment.

Another method which was popular at an early date included a technic which

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consisted of having the patient retrude the tongue as far as possible to the posterior portion of the mouth and swallow. It was assumed that the backward pull of the tongue muscles and those in the floor of the mouth, assisted by the force of gravity, would place the mandible in the desired position. We find many modifications of this technic still in use in some parts of the country. For example, some operators place the patient in a recumbent position with the head thrown as far back as possible. Then, with the tongue in the retruded position, the patient is instructed to open and close the mouth. This position is supposed to cause a greater distal pull on the muscles attached to the mandible, and thus assure its proper functional placement.

Still another modification is one in which the bite-blocks are constructed and the working plane is established, and then a heavy ridge of wax is built extending from heel to heel of the upper bite-block. The patient is instructed to open, place the tongue back of the ridge and exert pressure forward during the act of closing.

Jacob Green developed a somewhat different method to be used in conjunction with the impression technic which he later developed and advocated. The bite-blocks were completed and trimmed to correct vertical dimension and the approximate working bite. The patient was then instructed to open and slowly close until the rims of the bite-blocks were separated about 3 or 4 mm. The patient then held this position from one to three minutes, or until the mandible began to tremble or quiver from muscle fatigue. The muscles, as they became tired, relaxed and the mandible automatically drifted to the correct retruded relation. The jaw was then gently closed by the operator in this supposedly correct relation.

Several years ago, it was noted by some one that when the teeth of the mandible and maxillae were in centric occlusion and the muscles of mastication were forcibly contracted, there was a pronounced contraction of the temporal muscle. This could be felt easily and was at times plainly visible. When the mandible was placed in a lateral or protrusive relation (and thus the teeth were brought into eccentric occlusion), it was impossible to exert enough pressure to produce this characteristic contraction.

The cause of this phenomenon was the fact that when the teeth were in centric occlusion, the functioning planes of the teeth were in maximum contact, and the exertion of sufficient force to cause this contraction was not difficult. When the teeth were in eccentric relation, the muscle could not be contracted. Let us see whether this is true.

It is acceptable to say that when the functioning planes of the teeth are in maximum contact, this contraction is possible. When the natural teeth are lost and bite-blocks or occlusion rims take their place in the mouth of the patient, the latter are also in plane contact. When the patient closes in centric occlusion, he contracts the temporal muscle. When the mandible moves to eccentric relation, the occlusion rims are still in plane contact, this making possible the exertion of greater closing force, and, in this relation and under these conditions, the temporal muscle can be contracted.

A simple experiment in further proof of the fallacy of this method will be quite convincing. A piece of ordinary blotting paper is folded to about two or three thicknesses and to a size sufficient to just cover the occlusal surfaces and incisal edges of the natural teeth. This will form a pad or "shock absorber" for the teeth. With this pad in position, the patient is instructed to close in centric occlusion and the contraction of the temporal muscle is noted. The mandible is now forced into right, left or protrusive relation and closed, and it will be found an easy matter

to produce an equally definite muscular contraction.

This technic is in general use in some sections of this country, and yet it is one of the most unreliable in practice today, as I shall attempt to demonstrate later.

Another method being used in some portions of the United States with a limited degree of success may, in certain cases, give fairly accurate results, but is by no means infallible.

The occlusion rims are constructed, and the plane of occlusion and vertical dimension is established. The patient is then requested to leave the operating chair and take a standing position in a convenient place in the operating room. He should not be advised as to what the operator is attempting, and should at no time be instructed to "bite" or "close" the occlusion rims in any particular way. It is a well-known fact that some edentulous patients who have been without artificial dentures for a long period of time, or those who have been wearing ill-fitting dentures for several years, have little control over the movements of the mandible. Especially is this true when certain designated movements are attempted under stress and excitement.

The patient will first assume a tense or strained position. Particularly will this be true of the muscles of expression. The operator begins a meticulous study of facial contour, studying carefully the frontal and profile view. The patient is asked questions which are likely to promote conversation. If this is unsuccessful, he is asked to read something aloud, speaking as slowly and as distinctly as possible. This division of his attention between reading and talking distracts his mind from the strange objects in his mouth.

Valuable information may at times be gained from this step in helping to determine the correct incisal length for both esthetic and phonetic requirements. The patient can be asked to repeat the word "Ohio" twice, the word "Iowa" three times, and again "Ohio" twice in rapid succession. Here again, the attention is drawn from the occlusion rims by mental counting, which still further assists in the necessary relaxation. It should also be noted by the operator whether the occlusion rims come in contact at any time during the repeating of these syllables. If they do, the vertical dimension must be shortened, as otherwise the teeth of the finished dentures will probably strike prematurely in the mouth, with that offensive clicking sound so characteristic in some denture patients.

After a time, when the patient has become accustomed to the feel of the occlusion rims in the mouth, and the muscles of expression have fully relaxed, he is asked to assume a position of perfect rest and relaxation, and to gently bring the lips to a comfortable and unstrained contact. The occlusion rims should be separated approximately from 1 to 3 mm., but should not touch. This is the approximate rest position of the natural teeth. If there is a slight evidence of tension remaining in the muscles of expression, the patient is asked to moisten the lips with the tongue. This is an old trick used by many photographers to get a natural, unstrained expression when taking a photograph.

The operator is now standing perhaps 3 or 4 feet, or more, from the patient, and quietly asks him to swallow, and, as he makes the request, steps toward the patient, arriving at his side just as the act of swallowing is consummated. He grasps the head and chin firmly and instructs the patient to hold that exact relation, and not to make the slightest alteration in the mandibular relation.

The upper lip is now raised, and, on either side of the occlusion rims, a vertical line is cut in the wax or compound in the region of the first bicuspid area and crossing the plane of occlusion. Now the patient is returned to the operating chair and instructed to open and close re-

peatedly until asked to stop. At the first closure, it will probably be noted that, owing to protrusion of the mandible, the vertical guide line will be broken at the occlusion plane. This relation will prevail for perhaps several closings. Soon the muscles will begin to tire and the mandible will gradually start to drift backward, until finally the two parts of the vertical guide line above and below the occlusal plane are again united. From that time on, the patient will open and close in this relation indefinitely. This is accepted as evidence that the mandible is in correct centric relation.

There are many other tests in practice for establishing centric relation, but those enumerated are, I believe, sufficient for our purpose at this time. It will be noted that all these methods place the mandible in a position believed by the operator to be correct centric relation. There is, however, in each method, a definite element of guess, with nothing positive as to the accuracy of the results.

Now let us analyze for a moment just what we are attempting to accomplish:

First, it seems advisable to distinguish between "centric occlusion" and that which we are seeking; namely, "centric relation."

Centric occlusion is that relation of the mandible to the maxillae in which the functioning planes of the teeth are in maximum contact. Here, we have a definite fixed position, one that is easily identified by both patient and operator, and one to which the patient can return repeatedly at will.

In our definition for centric relation, we find something much more indefinite and difficult to secure because the patient can be of little or no assistance, and, with the methods discussed up to this time, the operator has absolutely no check by which to gage his accuracy.

"Centric relation is that positional relation of the mandible to the maxillae where the condyles are in their most retruded position in the glenoid fossae, from which all lateral movement starts."

Here we have a much more difficult problem to solve: two objects placed in a certain and definite relation to each other without any guide, such as occlusion or contact, to assist either patient or operator.

There is another very important element that must be considered also. Every dentist is well acquainted with the fact that patients develop for themselves new, or abnormal, functioning positions of the mandible. This may be due to habit, extraction or the presence of an ill-fitting or uncomfortable bridge, inlay or partial dentures. Under such conditions, the patient selects certain teeth to do all the masticating from that time on. This may continue over a period of years, or until the patient has acquired an entirely new or different functional position from that of centric relation. This new acquired functional position is, as far as the patient is concerned, the most comfortable and efficient point for mastication, and he will naturally open and close in this rather than in the centric relation. He will return to centric relation only occasionally and scarcely ever during function.

Every dentist has had the experience of establishing centric relation, or "taking the bite," and feeling quite confident that he has been successful beyond any question. The patient has made the same movement over and over again, and this is accepted as sufficient proof of accuracy. When the dentures are finished and placed in the mouth, the operator is shocked and even bewildered when the patient goes into a completely new, eccentric relation which does not even approach the one recorded as centric. What has happened is this: When the operator was endeavoring to establish centric relation, the patient was giving an acquired functional relation, and when the dentures were completed and placed in the

mouth, restoring normal conditions, the patient momentarily returned to the true centric position; or the reverse of this may be true.

It is my opinion that every patient has an acquired functional position varying from centric to a greater or lesser degree. When this position is accepted as centric, spot grinding, milling, after-treatment for soreness, rerimming, rebasing and make-over will be necessary in direct proportion to the variation between the acquired functional position and centric relation.

The question may well be asked: If the patient has developed this acquired functional position over a long period of years, why not construct the dentures to this point, and let him continue in the future as in the past? The answer is this: He *will* continue to masticate in the acquired relation, but the mandible, in arriving at this relation, will pass through many excursions from true centric position, causing trauma and soreness which, in turn, are invariably followed by resorption.

There is no substitute for centric relation. It must be accurately established, and functional positions acquired by the patient through habit, or otherwise, must be accommodated *from* centric rather than accepted *as* centric relation.

To refer again to the different methods employed in establishing centric relation: it will be noted that in each and every technic there is no possible way of determining whether the teeth are in centric relation or an acquired functional position or in some intermediate position different and apart from either.

There is a simple, accurate method of determining centric relation, one that requires no expensive equipment and that can be used in conjunction with any denture technic or on any kind of articulator. It does not consume a great amount of time, and gives a definite and accurate picture of not only the true centric relation, but also any acquired functional positions which the patient may have developed.

It demonstrates all abnormal and unusual mandibular movements, and all degenerative changes in the temporomandibular articulation that have affected mandibular movements during function; and it is a simplified technic for making a gothic arch tracing of mandibular movements in the individual patient.

The gothic arch was first given a practical application in denture construction by Alfred Gysi. Since its introduction, it has been modified in many ways. It is unfortunate that its use has been associated with complicated and difficult denture technics so often that it has become more of a mystery than a definite aid. Its use does not require any more time than many of the other less accurate technics, and if the time that it saves in spot-grinding, milling and after-treatment is considered, it is a definite and valuable time saver.

There are many different technics for employing the gothic arch tracing, intra-oral, extra-oral, single tracings, multiple tracings, a centric bearing area tracing and the multiple surface tracing; all of which have their advantages and disadvantages, depending on the likes and dislikes of the operator using them. There are also many different types of equipment and tracing appliances available. Here again, it is largely a matter of choice and opinion. It is not, however, within the scope of this paper to discuss separately the qualities of each of these different technics and various kinds of equipment.

I shall confine myself to what I believe to be one of the simplest, most practicable and most applicable single technics. I hope to remove completely its shroud of mystery and expose it as a simple, practical procedure, suitable for every general practitioner who is called on in his practice to construct artificial dentures.

Simply, what is this gothic arch trac-

ing, how is it made and what information does it impart?

Let us take a dry skull and mandible and study the various movements involved in making a tracing. First, hold the mandible in such a way that both condyles are firmly seated in their most retruded position in the glenoid fossae. Now holding the right condyle in this position, slowly bring the left condyle forward to the *eminentia articularis*. The condyle thus brought forward moves in the path of an arc around the stationary condyle, and the *symphysis mandibulae* moves laterally, describing a similar arc. When the condyle is returned to its original position, these points retrace their path along the arc to their exact starting point. They cannot go farther, and no matter how often this movement is repeated, it will always follow exactly the same path.

Now hold firmly in a fixed position the left condyle, and repeat the same movement with the right condyle. It will be found to describe a similar arc around the fixed condyle, and the symphysis will do likewise. The symphysis, it will now be noted, has described two arcs, each a part of two different circles which, if completed, will overlap in such a way that their two circumferences will intersect at the point of rest, or that point to which the symphysis must return when both condyles rest in their most retruded position in the glenoid fossae.

When both condyles are brought forward simultaneously, this point at the symphysis will move freely to any point outside the circles described, but when the condyles are returned to their original seats, the symphysis must always return to its exact starting point. This point then becomes the intersection of two arcs forming the apex to a gothic arch. This apex then represents "the most retruded position of the mandibular symphysis when the condyles are at rest in the glenoid fossae," and this, it will be remembered, is a part of our definition for centric relation.

While it is quite evident that the gothic arch thus formed is composed of the arcs of two members, each the arc of a circle, for all practical purposes they are considered as straight lines and form an external angle which may vary from 50 to 175 degrees.

Now let us see how this same procedure may be applied to a practical case. We shall assume that the bite-rims are completed and the plane of occlusion is established. To the lower bite-rim is attached a tracing table, which will later be described in detail. To the upper bite-rim is fixed an incisal path marker. These are now placed in the patient's mouth and the bite-rims brought into occlusion. The tracing pin is released and makes a contact with the tracing table. The patient now moves the mandible to the right and left lateral positions until the table shows a definite gothic arch tracing. The tracing pin is centered directly in the apex of the tracing and firmly held there by the patient while the upper and lower bite-rims are fastened together. The two bite-rims are then removed in this relation and transferred to the articulator, where the cases are mounted in exactly the same positional relation as that of the mandible and maxillae in centric relation.

If we will recall our undergraduate days, we may remember a definition somewhat like this: "A bite is a plastic material placed between the jaws when in centric relation to obtain the correct relation of the casts to the jaws." Through the medium of the gothic arch tracing, this has been accomplished by the most accurate method known. The gothic arch tracing not only gives to the operator the point of exact centric relation, but also imparts much other valuable information regarding the individual characteristics of the particular case in hand.

As has been previously stated, most of the angles thus formed will be simple ob-

tuse angles. However, there are different modifications of this tracing and each has its own meaning. Occasionally, the tracing will show two well-defined lines converging toward an apex or angle. The apex will be missing and in its place will be a flat or rounded surface connecting the two lines. This is information of great significance because it shows that the condyles can no longer return to their original seat in the glenoid fossae and so the mandible remains in a constant protrusion. This condition is usually found in patients who have lost their natural teeth and have been without artificial dentures for a number of years; or in cases in which artificial dentures have been worn many years and the bite has closed, and thus the vertical dimension is shortened.

This condition can be corrected, if the necessary change is very slight, by reestablishing the apex or correct centric relation. If a correction of more than 1 mm. is required, the change cannot be accomplished with comfort to the patient unless it is very gradual.

The same type of a tracing will be found in the attempt to make a record when the natural teeth are present. The mandible cannot be brought directly forward in this case until it has been opened slightly to release the overbite of the anterior teeth and the interlocking of the cusps of the posterior teeth. This slight opening movement may remove the condyle heads from their retruded seat in the glenoid fossae, in which event a tracing with a flattened or rounded apex must necessarily result.

At times, the tracing will appear not as a definite angle with a distinct apex, but rather as a straight or slightly curved line. Such a tracing indicates that the glenoid fossa is practically a flat surface, and that the condyles move almost straight forward during the opening and closing of the mandible. In such instances, there is a corresponding flatness of the curve of compensation and of the cusps of the teeth, and a minimum of overbite. As this looseness of articulation will permit a certain latitude in the locating of exact centric relation, any point selected in the near vicinity of the normal apex will be entirely satisfactory.

A small percentage of patients have the power to retrude the mandible distally to centric relation. In such cases, we find a normal tracing with a distinct apex; but extending from the apex will be found a line from 1 to 3 mm. in length. If the end of this short line is accepted as centric relation rather than the apex of the angle, it will require no end of "spot grinding," "milling" and "after-treatment" to relieve the trauma, soreness and resorption that are sure to follow. The only way that a patient can use such dentures is to slide them straight forward before they can go into either a right or a left lateral range. This cannot be done without producing trauma and soreness, both of which are invariably followed by resorption and tissue change. It is not uncommon for an operator to request his patient to "bite back" or "draw the mandible back as far as possible"; and give other similar instructions. If the patient obeys, there is but one way of determining whether true centric or a retruded relation is registered, and that is with the gothic arch tracing. This brings us to the last part of the definition for centric relation, which I shall repeat.

Centric relation is that positional relation of the mandible to the maxillae in which the condyles are in their most retruded position in the glenoid fossae, *from which all lateral movement starts.*

In almost every case, after the tracing has been completed, it will be noted that, at some point within the tracing other than at the apex, the patient will "open" and "close" repeatedly. This indicates an acquired functional position, which has already been discussed. Let me again emphasize the importance of recognizing this position and establishing definite cusp

clearance to it from every direction; for it is highly probable that function will continue in or near this position. In working to this point, however, the mandible will pass through the various movements involving the entire field, as designated in the tracing.

Again, it should be noted that the gothic arch method is the only one which gives this accurate and definite information regarding not only correct centric relation, but also the acquired functional movements of the mandible.

Now let us consider the problem as to how we are going to make this tracing and secure this information. First, I wish to strongly recommend the use of the Snow facebow to secure the correct mounting of the upper cast on the articulator. This instrument was for many years considered necessary to successful denture construction. It then fell into disuse and has remained so for several years. I believe that there is a growing tendency toward its return to favor, and I predict that, in the next few years, we shall see its almost universal return to the offices of operators rendering any considerable amount of denture service. While I do not believe it to be absolutely essential to successful denture practice, I do believe that when its value as a time saver is realized by the profession, it will be widely adopted once more. Its use is so simple and does so much toward reducing "spot grinding," "milling" and so-called after-treating that it seems almost foolish to disregard it.

FACEBOW TECHNIC

Now let us assume that our patient is present, that we are constructing full upper and lower dentures, and that we have reached that stage in our technic where we wish to make the facebow transfer and establish centric relation. The index finger of each hand is placed in the vicinity of the condyle and slight pressure exerted, and the patient is instructed to repeatedly "open" and "close." The condyles will be easily felt and can be located with reasonable accuracy. A small dot is made upon the surface of the skin with a soft lead pencil directly over each condyle.

The bite-fork of the facebow is warmed in the Bunsen flame and inserted in the wax of the upper bite-plate about 2 or 3 mm. above the plane of occlusion. The stem of the bite-fork should extend forward at the median line and parallel to the occlusal plane. The upper bite-plate is now placed in the mouth with the stem of the bite-fork extending forward between the lips. The facebow is centered over the face with the stem of the bite-fork engaged in the lock nut of the bow. The adjustable condyle lug on the left side is centered over the small spot which designates the head of the left condyle and firmly held there by the right hand of the operator. The condyle lug on the right side is next centered over the spot locating the right condyle and firmly held by the left hand of the operator. While held in this position, the condyle lugs are slowly pressed in or out, as the case may require, until the facebow is centered on the face, and while it is firmly held in that position, the patient is requested to tighten the lock nut holding the stem of the bite-fork. When this has been done, the operator releases the right hand and gives an additional turn to the lock nut to make sure that it will hold the stem firmly, and the instrument with the upper bite-plate is removed from the face.

The facebow and upper bite-plate are now placed on the articulator. The upper cast is placed firmly in the upper bite-plate and, in this relation, is mounted on the articulator. The facebow has now accomplished its purpose and is removed from the articulator.

We now have the upper cast mounted on the instrument in exactly the same relation to the opening axis as exists between the maxillae and the temporomandibular articulation in the

patient. In other words, we have recorded the exact altitude of the Bonwill triangle for this particular patient.

The bite-fork of the facebow is now removed from the upper bite-plate and in its place the Gysi incisal path marker is set. This is done by warming the base wings of the marker in the Bunsen flame and sinking them into the wax of the bite-plate about one-eighth inch. A little hard or sticky wax may be added to make this attachment firm. The tracing pin now extends forward from the bite-plate about three-quarters inch in the median line and on the occlusal plane. It will be noted that the tracing pin does not stand vertically to the plane of occlusion but leans forward at an angle of about 60 degrees. This is to prevent the pin from striking the tracing table and dragging during the act of closing, and thus giving a false tracing.

We shall now construct a tracing table and attach it to the lower bite-rim. For this purpose, a piece of 24-gage brass plate about 1¼ inches square is used. A 25-cent piece is placed on this plate and outlined with a lead pencil. This circular piece of plate is now cut out, on one portion of the rim a dovetail extension being left about one-fourth inch long and one-half inch wide. This extension is then bent downward at right angles.

The tracing table is held with a pair of tweezers, and the top surface coated with carbon. This is done by wrapping a small amount of cotton around a match stick, dipping it in oil of cloves and setting it ablaze, and holding the flame under the flat surface of the inverted tracing table. A piece of paraffin wax about the size of a grain of rice is now placed on this carbon coated surface and held over the flame until it melts and covers the entire surface. When cool, this acts as a fixing agent and makes it possible to handle the tracing table without marring its recording surface.

A wax spatula is now heated and forced into the center of the occlusal surface of the lower bite-rim at the median line to a depth of about one-fourth to one-half inch. The dovetail portion of the tracing table is next driven into this warmed wax, holding the tracing table firmly to the lower bite-plate and extending forward along the plane of occlusion in such position as to rest directly under the tracing pin, when the upper and lower bite-plates are placed together in their proper relation. If necessary, a little hard wax may also be used to insure a firm attachment of the tracing table to the lower bite-plate.

The lower bite-plate is now placed in position in the mouth and the upper bite-plate is seated. Any tendency of either or both bite-plates to move in the mouth can be corrected by the use of a small amount of gum tragacanth or adhesive powder on the bite-plates before their insertion. This should be rarely necessary if an accurate technic has been followed in the previous steps of construction. The pin of the incisal path marker is now in contact with the tracing table and the patient is instructed to slowly slide the mandible forward, backward and from side to side.

Usually, only a few such movements are necessary before the complete tracing is definitely and distinctly visible. Then the patient should be instructed to "open" and "close" several times, to determine whether there is an habitual or an acquired functional position. This will be demonstrated by the tracing pin striking repeatedly at some point in the tracing other than at its apex. This point should be carefully noted and the tracing pin returned to the tracing apex. It is now firmly held in this relation while the upper and lower bite-plates are fastened together, either by searing or with heated wire staples. There is on the market a small four-point staple, called a trial

plate clamp, that is excellent for this purpose.

With the bite-plates firmly fastened together in correct relation, and with the tracing pin at the apex of the gothic arch tracing, the patient is instructed to slowly open the mouth and thus disengage the lower ridge from the lower bite-plate. The operator now carefully loosens the upper bite-plate in the mouth and instructs the patient to slowly force the united bite-plates from the mouth, whence they are received by the operator. This is much better than attempting to take them from the mouth, as there is danger of their becoming separated and their relation lost.

The two bite-plates, still in correct centric relation, are now taken to the articulator and the upper bite-plate is seated firmly on the upper cast, which, it will be remembered, has been previously mounted on the instrument in its correct anterior-posterior relation.

The instrument is now inverted and the lower cast firmly seated in the lower bite-plate and mounted on the articulator.

Let us again return to the definition of a bite: "A bite is a plastic material placed between the jaws in centric relation to obtain the correct relation of the casts to the jaws." This procedure we have carried out, and we are now ready to continue with the construction of the case.

To many of you, this review of the tracing technic may seem elementary. To others, it may seem unnecessarily long. No one can say that it is inaccurate. To those of you who are using the gothic arch tracing in any one of its many forms, I can give no message. To you who are not using the tracing technic in some form, I can only say that if you will but adopt it, you will save yourself much time and regret and will deliver to your patients a higher standard of denture service.

The description I have just attempted of a suggested technic may have seemed unnecessarily long, but not only has every step of tracing technic been described, but also the complete technic for the construction of much of the necessary equipment has been outlined. I may add that eight or ten tracing tables should be made ready at odd times and kept ready for use. The entire time involved in making a tracing for the average patient should range between five and ten minutes. Extreme cases may take longer, of course, but such cases require the increased accuracy which the tracing gives. In the final finishing of the dentures, much time will be saved by the elimination of milling, spot grinding and after-treatment. I sincerely believe that this technic adds much to the masticating efficiency of artificial dentures, which, after all, is second only to esthetics.

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LYMPHOSARCOMA OF THE JAWS AND PALATE

By George W. Christiansen, A.B., D.D.S., M.S., Detroit, Mich.

LYMPHOSARCOMA of the jaws in young children is rare and the prognosis is poor. Darlington and Lefkowitz[1] report a case which occurred in a girl 7½ years of age and involved the upper jaw in the region of the antrum. This child died in about seven weeks after the first symptoms of the tumor. In adults, New and Cabot[2] report three lymphosarcomata of the antrum, and sarcomata of the upper jaw are reported by Geschickter,[3] Figi,[4] Harmer[5] and Öhngren.[6]

Fig. 1.—Decalcification of left side of mandible (A).

TREATMENT

Treatment recommended by these men consists of a combination of surgery, diathermy and irradiation according to the findings. Figi believes that highly malignant lymphosarcomata are more satisfactorily treated with radium inserted directly into the growth or applied over its surface. Geschickter found that those treated with adequate radiation proved radiosensitive, diminishing rapidly in size, but in no case was a cure established. Radical excision with cauterization or resection and excision combined with irradiation were the methods of treatment without notable benefit.

REPORT OF CASE

History.—Examination of the mouth of a 5-year-old boy early in July of 1936 disclosed swelling on the alveolar ridges on each side of both upper and lower jaws in the region of the molar teeth. The past history was definitely negative except that for two weeks previously the child had been restless and uncomfortable.

Examination.—Extra-oral roentgenograms revealed extensive destruction of bone in the mandible and the right maxilla. (Fig. 1.) In these regions, the teeth were loosened and partially submerged in the new tissue. Inci-

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sion of two of the masses for biopsy yielded no blood nor pus, but the section taken from deep in the right upper region showed destruction of the antral floor.

Pathologist's Report.—Gross description: The specimen consists of numerous carious teeth and fragments of loose alveolar tissue exhibiting marked edema.

Microscopic description: The section is a malignant connective tissue new growth composed of undifferentiated endothelioid cells having a large round hyperchromatic nucleus and very little cytoplasm. The new growth tissue is of the medullary type, is very well vascularized and is apparently attempting to

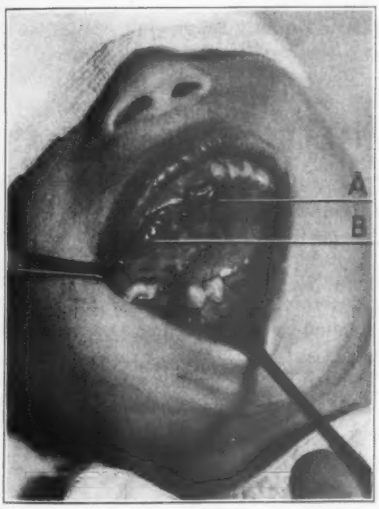

Fig. 2.—Hypertrophy of palate with early lobular changes (A, B).

form blood vessels. Local areas show myxomatous degeneration with necrosis.

Diagnosis: The diagnosis is lymphosarcoma, of Grade IV malignancy and Grade O radiosensitivity. (This conclusion as to extreme virulence was based not only on the type of cell which *per se* is radiosensitive, but also on the clinical picture of several sources of the new formation.)

Course.—Ten days after the first examination, the growth covered most of the palate, approaching the midline from either side. (Fig. 2.) The mass grew with amazing rapidity, each day showing enlargement, and daily the child grew weaker from insufficient nourishment, since food intake became more difficult. Pain and discomfort were effectively controlled with morphine sulphate one-twelfth grain, as needed.

Three weeks later, the mouth was completely filled (Fig. 3) and the neoplasm protruded with enough pressure to rupture the right corner of the mouth. Breathing was also

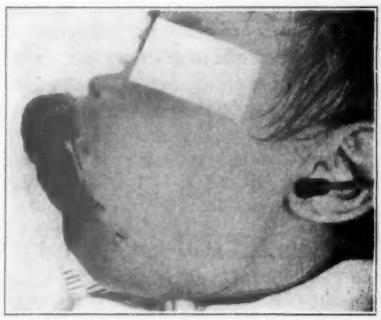

Fig. 3.—Left lateral view.

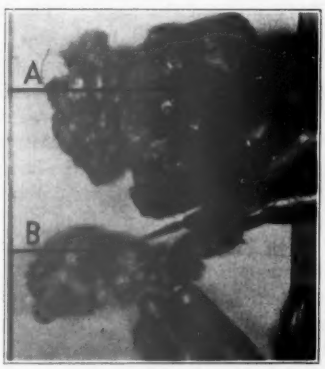

Fig. 4.—A, palatal mass. B, spongy left side of mandible. Bone has been replaced by tumor tissue.

impeded, since the nostrils were nearly occluded. (Fig. 3.) Death ensued a few days later, after about eight weeks of illness.

Necropsy.—At necropsy, the palatal mass was excised. The weight was 720 gm. and it measured 14 by 12.75 by 5.75 cm. (Fig.

4.) The growth had filled the right antrum, extending to the orbital floor. Figure 4, B, shows the destruction of the left side of the mandible near the angle and the substitution of tumor tissue.

COMMENT

The presence of the soft friable lesions on each side of the upper and lower jaws at the time of the first examination, together with the roentgenographic evidence of bone loss, indicated multiple origin of the growth. Furthermore, the coalescence of the mass near the palatal midline points to a bilateral source, with simultaneous growth in these areas and in the mandible.

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THE ETIOLOGY OF PERIODONTAL DISEASES

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THE topic of this paper, "The Etiology of Periodontal Diseases," was selected because of its first importance to a clear understanding and correct treatment of those diseases which, if allowed to go unchecked, will destroy the supporting tissues of the teeth. The causes of these diseases are of particular interest to every dentist, since many of them are to a great extent under the direct control of the practitioner of dentistry as far as dental patients are concerned. This is a somewhat consoling fact, for it means that we can do something about the loss of more than 50 per cent of the teeth that are extracted after 50 years of age and a slightly less proportion of those sacrificed in earlier adult life.

We are all well aware of the limitations of our most up-to-date restorative procedures to preserve the masticating machine in its entirety in a state of health and comfort, a condition which is being expected by an increasing number of dental patients.

The difficulties involved in producing even fair substitutes for the natural teeth, and the knowledge that the best dental work is not good enough, have served as a constant impetus to greater progress in the field of dental substitution. Overwhelming pride in spectacular technical accomplishments has frequently shifted our ethical perspective and displaced our judgment, so that we have continued to assume an air of complacency toward the extraction of loose teeth, assuring patients that it was inevitable since "pyorrhea is an incurable disease."

The substance of what has been stated thus far has been reiterated many thousands of times in the past fifty years, regrettably with little effect. It is still the custom to discount the importance of

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health of the periodontal tissues by failing to practice preventive measures for their protection; by ignoring all but the most severe and painful forms of gingivitis; by treating the more serious periodontal diseases superficially only; by careless operative and restorative procedures which commonly can be held directly responsible for destruction of the periodontium, and, finally, by neglecting to instruct patients effectually in the home care of the mouth. To the foregoing might be added also the continued indifference of the majority of dentists to clinics and papers relating to periodontia. The crowds are attracted where instruction is being given in the technic for removing the natural teeth and the newest ideas regarding their substitution and replacement. A patient recently remarked to me, "Why is it that dentists enjoy so much pulling people's teeth? Why, we have had a regular epidemic of tooth-pulling in our town! Practically all of my friends are wearing false teeth." If we would use the lay phrases "false teeth" and "tooth-pulling" more often, the seriousness of the situation would not be so lightly dismissed. The dignified sounds of the words "full dentures" and "tooth extraction" tend to obscure the tragedy of the loss of the natural teeth.

It is unfortunate that most reforms are the result of public demand; whereas they should have been instigated by those who were in a position to have anticipated the need many years in advance of its realization by the average person. Dental patients are waking up to a great need, and woe be unto any of us who may be found napping! The dental schools will be forced to provide adequate instruction in periodontia and to dignify it by giving it first place in the curriculum instead of using only what time is left after everything else is provided for and thus giving the subject a subordinate place.

It has been suggested that in order to gain a correct perspective on disease, we learn to think in terms of cause rather than of effect. This necessarily presupposes an altruistic dentist-patient relationship, and a general acceptance of the ideal of prevention, met frequently in dental literature but not so often in dental practice.

A close familiarity with the many etiologic factors of periodontal diseases, most of which are known to every dentist, is extremely important. These factors are unfixed and variable, usually dependent and related.

In explaining why a disease condition develops, W. H. Perkins, M.D., states:

> It does so in response to a chain of events which directs its course *only* in the direction necessitated by the *given* causes. Any slight alteration in the force or frequency of a causative factor or the addition or removal of factors may produce far different results. It would seem only necessary therefore to reveal those places in the natural history of a disease at which effective measures will block its progress.
>
> All of our hope in the prevention of disease rests on this principle.
>
> Viewed in its entirety, our environment is seen to contain most, if not all, of the initiating factors of disease.
>
> It is only when we look too narrowly at disease that we fall into the error of ascribing its causes to happenings within the diseased organism. The clearer but more difficult picture is obtained by pursuing events until the external environment is reached and the primitive simple factors are revealed.

According to Dr. Perkins:

> Causes of disease are classified into the following categories: 1. Inherited factors. 2. Defects of nutritive elements. 3. Exogenous chemical elements. 4. Physical force and energies. 5. Parasites. 6. Bio-social and psycho-biologic influences.

This approach to the causes of disease generally is so adaptable to the etiology of periodontal diseases specifically that a consideration of its application in the latter connection will be attempted.

Among the etiologic influences both primary and secondary, and long recog-

nized, have been those in Group 1; i.e., inherited factors. These no doubt may modify tooth form, arrangement and occlusion, cause the loss of permanent teeth, increase susceptibility to infection and affect the size and shape of jaws. Teeth with bell-shaped or diminutive crowns seem to invite unhygienic conditions in the gingival crevices. Similarly, a crowding of the teeth encourages filth to collect and also interferes with a normal circulation in the gingival septa, resulting in disease in these tissues. Any disarrangement of the teeth may result in over-use, lack of use, traumatogenic forces or food impaction. It is naturally not intended to imply that these are always inherited, but that they may be is generally conceded. How great the inherited tendency or resistance to periodontal disease is has never been decided, but many believe that it is a distinct factor in the establishment of, or protection against, these pathologic conditions.

The conventional remedy for these inherited conditions in childhood, as far as occlusion is concerned, is of course orthodontic interference and a dietary régime, with the patient under medical supervision. In adult life, however, this procedure is generally impractical and contraindicated. It is essential, therefore, if we would overcome the effects of these inherited conditions that the most rigid hygienic measures be instituted by both the patient and the dentist to counteract the tendency for unhygienic conditions to develop in the abnormal approximal and gingival spaces. Gingival massage applied by the patient is advisable also as a routine prophylactic measure, to promote the sluggish circulation which one so often finds associated with these abnormal conditions of tooth form and arrangement. An adjustment of the occlusion by grinding is generally necessary. This must not be undertaken, however, without a full knowledge of the correct procedure. By attacking the effects of these inherited conditions in the foregoing manner, we can, if associated conditions have been removed, usually prevent or control periodontal disease, which too often results in these cases in complete loss of the teeth. If the pathologic condition is well established when the case is accepted for treatment, satisfactory results will be more difficult to obtain and are often delayed. Hence, the need for the earliest possible recognition of any and all forms of periodontal disease.

The second category in the etiologic classification is defects of nutritive elements. This group of causes of disease, especially as it concerns dentistry, has received considerable attention in recent years. An increasing number of dentists are recognizing that our modern diet is abnormal and defective, and they are seriously investigating the prophylactic and therapeutic possibilities that lie in a sane diet based on scientific findings and common-sense observations. We are surrounded by the effects of overeating, starvation diets due to unintelligent selection of foods, hurried eating and eating of non-resistant foods, resulting in functional inactivity of teeth and jaws, one of the chief local causes of periodontal disease. Use encourages health. Lack of use, whether of an arm or the supporting tissues of a tooth, invites stagnation and atrophy. It is needless to consider this group of causes further than to urge that each patient with periodontal disease be requested to submit a one to two weeks dietary for study by the dentist. It is astonishing what this will reveal—how frequently one will find glaring errors in the food habits of otherwise intelligent people and how rarely selection of a well-balanced dietary is noted. If you doubt the efficacy of this suggestion, try it on yourself. You will be surprised at what you eat. It is difficult to believe that the majority of us would rather take a capsule or a tablet containing food accessories than to subject ourselves to even slight

discipline in the matter of eating when we are in normal health. Fortunately, however, our attitude changes when we are ill and we become much more cooperative.

When a patient has committed himself on paper as regards his food habits, it is not difficult to interest him in correcting outstanding errors in the choice of foods. Dentists should concern themselves about what their patients eat when it is appropriate to do so, if for no other reason than to get some conception of how little common sense is used by the average American citizen in his eating, as to what and how. It is not to be understood that dentists should advisedly plan diets for patients suffering from some general pathologic condition, but those who are interested in the subject can render an invaluable service to their patients by suggesting such improvements in their diet as common sense and modern dietetic and nutritional knowledge dictate.

Resistant foods are desirable for functional activity of the teeth and jaws, but to recommend coarse foodstuffs to every patient would be the height of folly, and serious consequences might follow where any disease of the digestive or intestinal tract exists.

The results of dietary deficiencies may be lessened by efforts to educate prospective mothers, and parents especially in their choice of foods not only for themselves but for their families.

In the treatment of periodontal diseases, the processes of elimination should receive attention, and their common relationship to the diet makes more important for the dentist, especially the periodontist, scientific and practical information on these and allied subjects.

The third group of causes, termed exogenous chemical elements, would include the unusual factors, such as mercury, lead, bismuth, arsenic, copper and phosphorus. These chemicals are classified in dental textbooks under direct causes of gingivitis, especially in unclean mouths. Where it is impossible to avoid exposure to metallic poisons, the effects can be somewhat controlled, it is authoritatively stated, by a high standard of mouth hygiene.[1] Arsenic is a protoplasmic poison and great care should be exercised in its use.

Of the common exogenous chemical elements which we must recognize as potential barriers to health and as poisons are: alcohol, nicotine, caffeine, morphine and opium, and innumerable patent remedies which may easily be consumed beyond the limits of tolerance. It would be thwarting a powerful ally of disease to urge patients to use caution and reasonable temperance in their use of poisons, warning them of their insidious dangers.

The fourth group of causative factors, physical force and energies, we might illustrate by traumagenic occlusion; blows; food impaction; torque of removable bridge abutments; impingement on tissues of crowns, clasps, inlays, fillings and pontics; extreme malocclusion; calcareous deposits; excessive or improper toothbrushing; injury from toothpicks or loosened toothbrush bristles or dental floss, extreme methods of separating teeth; careless use of matrices, clamps and ligatures; the use of improper orthodontic methods and appliances; excessive planing of root surfaces; unskilled curettage; neglect to carefully check the occlusion in all restorations which may change occlusal relationships in any way, and thermal shock. These causes of periodontal disease are largely under the control of dentists and their patients.

Kronfeld, in his book on periodontal diseases, mentions the early observations of G. V. Black that, in 500 cases examined, only 5 per cent of the mouths were entirely free from gingivitis. Of the remaining 95 per cent, about 45 per cent were attributed to the presence of calculus, 37 per cent to imperfect dental operations

and 18 per cent to malformation and malposition of teeth. Gottlieb claims that 90 per cent of so-called pyorrhea cases are due to neglect and lack of cleanliness. These references are made to emphasize again the part that dentists are able to play in the eradication and prevention of periodontal disease. It is unnecessary to wait for extended research in this field or for the evolution of a pill to make great inroads on this most common of disorders of the mouth, which daily takes its toll of thousands of vital natural teeth.

The fifth category is labeled parasites, which are considered by some authorities to be the chief cause of periodontoclasia. Hartzell[2] believes that "the destruction of the periodontal membrane and the bone surrounding it and the tissues surrounding the bone is due to the action of pus-making bacterial ferment." He states further that "we can never expect to eliminate bacteria entirely from the human mouth, but we can reduce the amount of growth in the human mouth and particularly on teeth and in the tissues about the teeth to a minimum, so that little or no harm can result from their presence; for it is easy to neutralize their ferment, even though we cannot prevent their growth." Most periodontists are agreed that the cleanest possible oral condition must be established and maintained in every mouth afflicted with periodontal disease in any stage of its development and those measures instituted which will make this objective attainable. They believe that this group of causes is open to attack and can be controlled by well-established procedures and dentist-patient cooperation.

It is my conviction, after more than thirty years of practice devoted exclusively to periodontia, that our most powerful and effective weapon of defense against most dental and periodontal disease is, in the words of D. D. Smith,[3] expressed nearly forty years ago, "change of environment for the natural teeth, frequent, forcible, thorough." Dr. Smith stated that mouth infection due to the presence of the teeth "begins with the eruption of the deciduous set, and continues with increasing gravity through the period of shedding the temporary and the erupting of the permanent ones, and thence on so long as untreated natural teeth are retained in the mouth." J. O. McCall has, in recent years, urged that we pay attention to the gravity of early establishment, in the mouths of children, of infectious conditions, a forerunner of periodontal disease.

Although the patient should be held responsible for the hygienic environment of his teeth after a state of health has been established, previously to that time limited cooperation only should be expected of him and the responsibility is largely that of the dentist. The expectation that a patient will keep an unhealthy mouth with sensitive teeth and gums mechanically clean is a common and outstanding error of judgment on the part of dentists. After the mouth is healthy, this should be not only expected but also demanded.

Since the mouth is an ideal incubator for micro-organisms, we can best decrease their numbers by first lessening the quantity and the palatability of the pabulum in the oral cavity and by reducing the hiding and hibernating areas. As assistant architects for dental structures, we should limit our building specifications for caves, wall garden ledges and dens for *B. acidophilus,* i.e., poorly fitting inlays, overhanging margins of fillings, crowns and certain bridge attachments; destroy all plans for tents to shelter Vincent's organisms, flaps of tissue over erupting teeth; reduce the depth in our designs for swimming pools for the pyogenic cocci, and omit the stucco walls, periodontal pockets, lined on the root side with silicate fillings or with gouged cementum.

Regular and frequent disturbance of stasis between the teeth by the patient is

important, whether it be accomplished by use of the toothbrush, dental floss, rubber cone or soft wood points. Other well-known oral hygienic measures will also reduce these invading parasites and limit greatly their destructive action. Patients should be taught that they should guard the health of their mouths by keeping the teeth and the spaces between them and the tongue absolutely clean, and not to expect to go to the dentist to have their teeth cleaned. This change in the shouldering of the responsibility has a very desirable effect and increases the interest in oral health. Expecting the impossible is uncalled for, but a reasonable effort on the part of patients will work wonders in a healthy mouth.

The sixth and last category listed is biosocial and psychobiologic influences. No doubt, most dentists have occasionally observed evidence in the mouth of the effects of extreme emotional states extended over a considerable period of time. Any deep emotional disturbance may upset the physiologic equilibrium via the central nervous system or the glands of internal secretion. It is thought by some that certain pathologic mouth conditions are directly traceable to this disturbance. This group of possible causes may well be dismissed with the recommendation that dentists follow the most interesting research that is being carried on in this field with the hope of gaining further means of combating dental and periodontal disease.

The less understood and more profound aspects of the etiology of periodontal diseases have been intentionally avoided for two reasons: first of all, because of their complicated relationship with general disease, and secondly, on account of a desire to deal only with those common factors which in my experience have proved amenable to control in 90 per cent of the cases treated. In order to obtain a permanently satisfactory result in any case, these simple causes must be considered to the greatest extent practical.

It is high time that radical steps be taken to eradicate this most insidious enemy of the natural teeth. It is no longer possible to retain the confidence of patients by evasion of the painful subject of pyorrhea when nothing has been done to check its progress. The time is now at hand when every ethical dentist must recognize the earliest symptoms of the various diseases affecting the supporting tissues of the teeth and be familiar with correct procedures in treatment. Most dental patients would rather pay their own dentist for saving their natural teeth than another dentist for artificial ones.

A mass of clinical evidence accumulated by a small group of dentists has demonstrated that correct attention to simple well-known causes (and effects) of periodontal diseases will keep the natural teeth in a state of health and comfort for many thousands of patients to their great satisfaction, and this in spite of the natural vicissitudes of human life.

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STRUCTURAL AND NERVOUS EFFECTS OF THUMB-SUCKING

By Earl W. Swinehart, D.D.S., Baltimore, Md.

BECAUSE of the great prevalence of the strikingly abnormal habit of thumb-sucking and finger-sucking and the possibility of damage to children, a voluminous literature has grown up around the subject. In large measure, it has been concerned with the etiology of the habit and has ranged through the philosophic and biologic discussions of such men as James, Dearborn, Freud and Levy to the unscientific writings of laymen. Despite this, there seems to be no lessening in the number of new cases, and millions of American children continue to practice the habits for varying lengths of time. As dentists have appropriated the mouth as their special field of work, and thumb-sucking is a mouth habit, it should be of especial concern to them to know whether it is harmful, and if so, to what extent.

At present, there is much difference of opinion as to the effects. From time to time, various authors have called attention to certain associated structural abnormalities and have cited these habits as causes. In the main, thought has been focused on the probable effects on occlusion of the anterior teeth. Much credit is due Samuel J. Lewis for producing the first accurate evidence on several controversial points through his systematic study of a group of young thumb-sucking children in Detroit. Among other important things, he found that, in those cases, the habits were all formed before 1 year of age; that malocclusion was invariably present in the deciduous teeth while the habits were in force, and that there usually was a tendency toward self-correction of the irregularity of the incisor teeth if the habits were broken before the children were 5 years old. Nevertheless, many still believe that the structural effects are negligible and transitory and do not justify widespread methods of prevention and cure. Certain physicians even encourage practice of the habits and advise that the immediate pacifying effect is beneficial to children.

In the hope of adding something of value to the fund of information concerning the subject, I wish to present some results of a study of thirty-eight such cases. The group was composed of fifteen boys and twenty-three girls, whose ages ranged from 2½ to 15 years. All of them were actively practicing the habits and all were cured. They were treated during the years from 1931 to 1935 inclusive, so that from one to five years have been available for observation.

Adequate records of the group have been kept. These consist of carefully prepared case histories, models, photographs, roentgenograms, treatment notations and a checkup system to date. As a part of the checkup system, the parents have made written reports of changes noted in the nervous reactions and social behavior of the children during the first year of treatment. Study has been given to the methods, the time and the intensity of the

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individual habits, as well as to the abnormal physical conditions found.

MALOCCLUSION

Tabulation and analysis of these data have yielded surprising facts, indicating that in considering these habits as simple practices of childhood the effects, if any, of which are slight and transitory, we have been making a serious error. Typical anterior malocclusion was found in more than 90 per cent of the cases, but was of minor importance as compared with other structural and nervous consequences noted. The other structural effects were frequently seen as a general malocclusion that was not amenable to self-correction and a malgrowth of the bone of the internal face that was beyond correction by either medical or dental means.

The records corroborate the findings of Lewis in that all of these habits were found to have been in existence during the first year of life, most of them in the early part of it. In three of the group, the habit was noted before the mothers left the hospitals. The fact of the very early and continued practice of the habits is of prime importance in weighing the potentiality of the habits as factors in the structural malformations that will be shown. Two things must be remembered: 1. In infancy, the bones are very plastic and can be molded easily by mechanical force. 2. Growth to maturity is a "fluid process." The bones reach their typal form and size only when there is continued equilibrium of the prescribed natural forces that have been set up to govern their growth. Any abnormal force continually applied may be sufficient to inhibit bone growth or to distort its form.

A detailed report of the malocclusion found and the study of the methods of the habits has already been made. Only a brief description can be made of the relations between them. The plaster models show that while nearly all of the regional and general types of malocclusion were found among the group, there were extraordinarily high percentages of certain forms. These were maxillary incisor protrusion, mandibular incisor retrusion, open bite, closed bite, abnormal narrowing of the maxillary arch and unilateral mesioclusion of the maxillary arch. The fact that in this group of thumb-sucking cases, the percentages of these particular types were so extraordinarily high pointed to the habits as their causes.

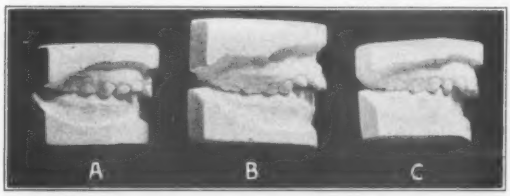

Fig. 1.—Protrusion. A and B: Simple labial tipping of maxillary incisors; arches normal width; thumb held in anterior portion of palate, with little contraction of cheeks during sucking. C: Extraordinary forward development of premaxillary bone carrying incisors bodily into protrusion; arches narrow. The thumb exerted strong muscular force in a forward direction while the cheeks were held tense during sucking. The case was not amenable to self-correction.

Also, the remarkable similarity found in the most prevalent types of malocclusion indicated that they had common causes and that these causes were definite, as are the mechanical forces in thumb-sucking. As examples, open bite was found only between the anterior segments of the arches, and the arch forms in 80 per cent were of the contracted-protracted type. That general disease would produce the sameness in pattern of mal-

growth seen among these cases did not seem reasonable.

Maxillary protrusion, of two types, obtained in 89 per cent. Usually, it consisted of simple anterior tipping of the incisors with little bone distortion. In the other instances, there was an overdevelopment of the premaxillary bone which carried the teeth bodily into protrusion. Mandibular incisor retrusion was found in 40 per cent of the cases, open bite in 50 per cent. A narrowing of the maxillary arch occurred in 82 per cent and unilateral mesial occlusion of the maxillary teeth in 31 per cent. These figures are all far above the average, but that is particularly true of the last condition. Angle, in an investigation of several thousand cases of malocclusion, found this type to be only 3.4 per cent as against 31.5 in this group.

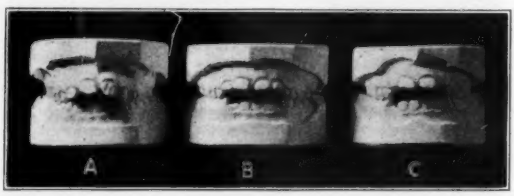

Fig. 2.—Secondary habits. A, protrusion originally caused by thumb-sucking, exaggerated by resting lower lip between arches. B, protrusion and open bite increased and maintained by holding tongue between arches, accompanied by mouth breathing. C, protrusion and open bite caused by thumb-sucking accompanied by tongue and lip habits and mouth breathing.

Study of the abnormal forces of the individual habits and malocclusion showed that the method, time and intensity of the habits were determining factors in the character and degree of the malocclusion. Whenever the abnormal forces were exerted in line with the natural courses of growth, there was overdevelopment. If they were in opposition to them, lack of growth and distortion were seen.

Without discussing a few peculiar methods of practice, it can be stated that when the thumb or finger was held in anterior position in the palate, only anterior malocclusion resulted. In such cases, the habit was practiced with but little contraction of the facial muscles. The arches were usually of normal width and in correct mesiodistal relations. The digits seemed to act merely as passive obstructions to orderly eruption of the incisors. The main dangers in this as a cause of adult malocclusion was that the disharmony it caused in the incisal region encouraged the formation of abnormal lip and tongue habits and mouth breathing. Seventy per cent of the children were mouth breathers all or part of the time. The secondary habits tend to persist after the thumb-sucking ceases and maintain or exaggerate the malocclusion caused by the thumb. The fact that they are not usually present in deciduous cases probably accounts for the high percentage of self-correction of these cases of anterior malocclusion when the habits stop before these deciduous incisors are shed.

GENERAL MALOCCLUSION

The more serious and permanent structural effects were seen in those cases in which the thumbs or fingers were held well back in the palate. One reason seemed to be that when they were sucked while in that position, the cheeks were kept tense against the buccal segments of the maxillary arches. This abnormal inward pressure was found closely associated with the high percentage of narrow arches, especially in the cuspid regions. Also, such a position of the digits always

caused protrusion of the incisors and the same pattern of contracted-protracted maxillary arch was frequently repeated. As the lack of normal arch width obtained with equal prevalence among the youngest children and the older ones, it seemed evident that if the habits were the cause, they originally inhibited the lateral growth when the deciduous arches were forming.

A third abnormal force of the habit was discovered in eighteen of the cases. Although unsuspected when the study was begun, it was found capable of doing far greater permanent damage than either of the two others. It consisted of muscular pressure of the thumb or finger against the palate. This force was distinct from the pressure caused during suction. In fact, there were two cases in which there was no sucking in the habits. Whenever it was present, there was a permanent depression in the palate at the site of the muscular pressure.

Two reasons were seen for this force. The most frequent cause was the fact that when the thumb or finger was held in anterolateral position in the palate, the hand was twisted outward and the arm was held away from bodily support. A counterpressure of the thumb or finger against the palate was necessary to steady the hand and lessen fatigue in the arm. The digit was held high on the anterior incline of the palate for a firm grip and the force was exerted in the anterior direction. There was convincing evidence that this anterior force which had been used during the plastic age of infancy distorted the growth of the maxillary bones in a forward direction on the sides under influence. Not only the bone, but also the teeth, rugae of the palates and other soft tissues were found anterior to their normal positions on those sides. That this force, exerted in an anterior direction, was invariably present in all of the twelve cases showing these malrelations indicated that it was the cause. It was always accompanied by the other forces. As apparent additional results, a narrowing of the maxillary arches and maxillary incisor protrusion were present, but in none of such cases was there any linqual displacement of the mandibular incisors. The accompanying illustrations show the types of malocclusion resulting from thumb-sucking in extraordinarily high percentages.

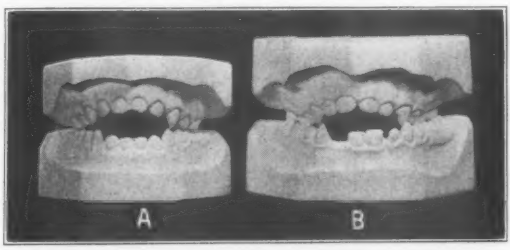

Fig. 3.—A, extensive open bite with narrow arches but without protrusion or retrusion. The muscular force of the thumb was upward in the center of the palate. B, obvious results of sucking middle finger while index and third fingers pressed against buccal segments of arches.

NASAL DEFORMITY

An investigation is now in progress to determine whether the effects of thumb-sucking extend beyond the mouth to the structures of the nose. This appears a logical assumption. The vault of the palate and the floor of the nose are formed by the same plate of bone. Its distortion upward would necessarily lessen the height of the nasal space. The growth of

the nasal septum is downward from a comparatively fixed point of articulation with the base of the brain case. Rhinologists consider the floor of the nose as the variable which may determine whether the septum attains its full length or is deflected. They also find close association between narrow arch formation and lack of width in the nasal space.

The study has not progressed far enough to warrant final conclusions, but it may be interesting at this time to see the nasal conditions of the two cases in which the distortion of the structures of the mouth was greatest. Figure 7 shows posterior views of models of these (B and C) in comparison with that of a fairly normal case (A) in which there was no thumb-sucking. The models have been cut away to the centers of the second deciduous molars, the regions in which upward distortion was the greatest. The ages of the children were 6, 8½ and 9 years. The respective arch widths at the level of the linguogingival margins of the second deciduous molars are shown. It is seen that in A and B they are almost the same, but C is 5 mm. less than A. The lines carried cross the models show the extent of upward distortion in B and C. The palatal height of B was about 4 mm. greater than that of the normal case A, and that of C was 7 mm. greater. The abrupt breaks in the curves of the palates of B and C also indicate the extent of upward distortion.

The anterior and posterior roentgenograms of the heads were made at about the ages of 12 years and are shown as posterior views. Figure 8 presents what the roentgenologist considers a normal nasal space for that age. It apparently was ample since the child was a perfectly normal breather.

Figure 9 shows Case B, in which there was normal arch width, but with about 4 mm. of upward palatal distortion. As seen, the nasal width seems normal, especially in the lower part. The roentgenologist reported that the floor of the nose was unusually high and that the height of the nasal space was less than normal. This was true despite the fact that the boy had a long face. The rhinologist found the bony septum to be fairly straight, but thickened in its middle portion. However, there was wide deflection of the cartilaginous portion of the septum to the left. Mouth-breathing and lack of resonance of the voice plainly indicated partial occlusion of the nares.

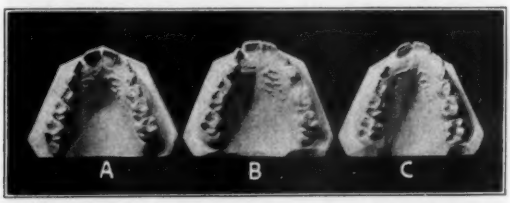

Fig. 4.—Characteristic narrow arch form, contracted in cuspid regions and protracted in incisal regions.

Figure 10 presents Case C, in which there was the greatest upward palatal distortion and greatest lack in arch width. The roentgenologist again reported that the height of the nasal space was very deficient and the width of the space unusually narrow. The septum is seen with such wide deflection toward the right that the upper nasal space on that side was almost closed. Mouth-breathing and the tone of the voice again indicate the conditions seen.

NERVOUSNESS

The close association of abnormal ner-

vous and psychologic phenomena with thumb-sucking is so apparent that scientists and laymen alike call attention to it. The child in which the persistent types are seen is often termed a high-strung or even a problem child. This close association has naturally led to the frequently proclaimed belief that whatever may be the exciting causes, the habits are really expressions of constitutional nervousness. Apparently, the failure to evaluate more correctly the relationship between the conditions has been due to lack of opportunity for accurate observation. Such cases have usually been studied individually and collectively only while the habits were in force and while treatment to cure them was being carried on in the home in the usual haphazard manner. As a rule, normal physical and mental phenomena have been regarded as natural conditions of childhood.

Fortunately, the study to be presented has been made under more favorable circumstances. In all of the thirty-eight cases under discussion, mechanical appliances were used which immediately prevented and permanently stopped the habits. This immediate stoppage of the habits has provided unusual opportunity to study in sharp contrast the nervous and psychologic phenomena of these cases during practice of the habits and after they had been suddenly prevented. It is unfortunate that the observations were not made by a competent psychologist, who doubtless would have greatly enhanced the value of the findings. As

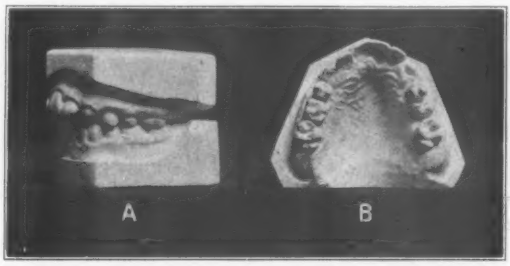

Fig. 5.—Case in which habit caused unilateral mesioclusion of maxillary arch. The occlusal view illustrates the palatal distortion of thumb pressure in an anterior direction.

this home treatment has been a long and trying ordeal for parents and child. Often, it has extended over several years, while one method after another has been tried. Some of these methods have cruelly interfered with sleep and the normal activity of childhood. Other children have been continually harassed by shaming, scolding and punishment. The effects of these measures often increase the nervous symptoms and encourage deceit and resentment and tend toward an inferiority complex. When finally the habits have been abandoned, victory has seemed sufficient unto itself and the cases have been considered closed. The former ab-

it was, only those symptoms that were so apparent as to impress the parents and me were included.

The case histories show that abnormal nervous and psychic phenomena were numerous and varied in nature. Some of them were not recognized as such until after they had ceased. For convenience of study, they could be divided into two groups: (1) muscular tics or attendant habits which were practiced concomitantly with the thumb-sucking, and (2) general nervous and psychologic abnormalities.

As examples of the first group, and most common, were twisting the hair,

pulling the ear, scratching the skin and playing with bed clothing or garments in various ways. One child added an extra tic of tapping the right foot on the ground if the thumb were sucked during anger. These concomitant habits were common to nearly all of the children and, in some instances, were continued despite the pain they must have caused. One child had a bald spot about the size of a dollar at the crown of the scalp from pulling out all of the hair; another kept a sore on the nose open by scratching.

The second group of symptoms was composed of abnormal mental and physical manifestations that affected the general well-being and social behavior of the children. A few of the children seemed comparatively free from these general symptoms, but usually one or more of the abnormal conditions could easily be recognized. The symptoms were invariably found in greatest number and severity in those cases in which the habits were practiced the longest time and with the greatest intensity. Neither age nor sex seemed to be a determining factor, aggravated cases being found among younger and older children with equal frequency and among boys as well as girls.

Time will permit discussion of but a few of these general symptoms. Some, though particularly harmful, were peculiar to the individual. Others occurred with such frequency that they might be termed characteristic of the habits. Surprisingly, the one most commonly noted was unsound sleep. These children seldom slept throughout the night without partially waking several times. The awakening seemed to be in response to the unconscious urge of the habit, as indulgence of it was followed by resumption of sleep. Another condition often noted among the aggravated cases was perverted or deficient appetite. In some of these, the habits were so appealing that they were preferred to meals, or meals were interrupted by them. Unusual restlessness, spasmodic twisting of the head and shoulders, inability to relax, lack of power to concentrate, quick temper and tantrums, crying on little provocation, unusual childish fear of unknown consequences, as in the dental chair, disinclination to fraternize and play naturally with other children were some of the symptoms often repeated in the histories. While certain abnormal manifestations were present more frequently than others, there was no definite group of them that was common to all of the cases, each one presenting its own abnormal picture.

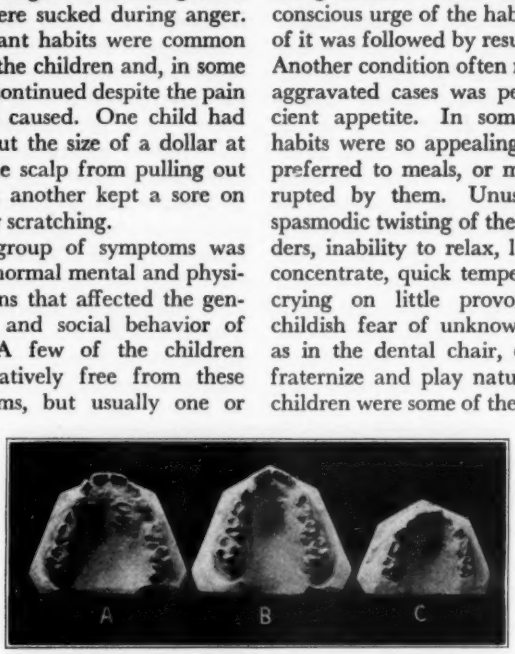

Fig. 6.—Three examples of palatal distortion at different sites of thumb pressure.

Figure 11 illustrates different views of the appliance used to correct the habits. It consisted of the familiar fixed bar across the palate to which had been soldered spurs about one-eighth inch in length. It was variously placed according to method of the habit and the position in which the thumb or finger was held. At first glance, such an appliance seems too cruel to be placed in the mouth of a child, but in practice it caused little pain from the beginning. The children were not incon-

venienced more than a day or two. They soon became oblivious to its presence, except when attempting to indulge in the habits. When put on, the projections had ball ends to protect the tongue from injury, as seen in Fig. 11, A. This was especially desirable when there was the accessory habit of thrusting the tongue between the arches. The success of the appliances was due to the fact that they continuously prevented the practice day and night until the involuntary neural stimuli of the habits were obliterated. The devices were left in place for at least six months, although it is possible that a shorter time might have sufficed in some cases.

In order to avoid misunderstanding, I wish to state at this point that there is no intention in this paper to weigh the comparative values of various methods of treatment. The appliance used is shown only as one of the data underlying the report. Other mechanical devices, judiciously used, are effective also. Psychologic methods based upon sound scientific principles such as those advocated by Dunlop and Levy are of demonstrated value. They are capable of doing greater general good than mechanical appliances because they can be used in the home without expense. Their weakness lies in the necessity of depending on all types of parents to follow them through intelligently and diligently to complete a cure.

In this comparative study of conditions before and after treatment, it was desired to clear the field of any nervous disturbance that might result from injudicious nagging by the parents. To accomplish this, all parents were requested to refrain from using any psychologic methods of cure in conjunction with the appliance or even any further mention of the habits in the presence of the children. At first, it was expected that there would be resentment and rebellion against such a positive appliance, which thwarted the long-established methods of gaining sleep and physical pleasure. Instead, it was surprising to note that the children really appreciated the value of the appliances. The older ones looked on them as good friends that relieved them of the responsibility of combating the habits and freed them from the continuous scolding and disciplining to which they had been subjected.

Of greater concern, when it was first planned to use the appliance, was the probable injurious nervous effects that might result from such a positive method. Some psychologists have expressed the belief that sudden breaking of firmly implanted habits is too great a shock to the delicate nervous systems of such children. Also, it is the general belief that thumb-sucking provides an outlet for surplus nervous energy and that if that avenue is shut off, the energy will be expended through the formation of other habits, often more damaging. Neither of these dire results was observed. On the contrary, there was a decided lessening in the nervous complex. The concomitant habits, such as were before mentioned, being due to the same neural stimuli and response, ceased immediately. Even within the first few weeks of treatment, there were such

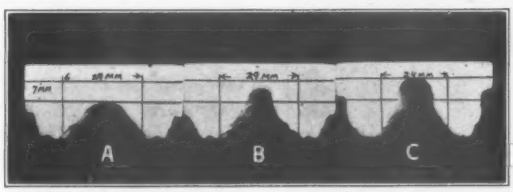

Fig. 7.—Posterior view of models shown in Fig. 6. A: Fairly normal as compared to B and C, the result of thumb-sucking.

unmistakable signs of improvement in the general phenomena that only one conclusion could be drawn: that most of the abnormal nervous and psychologic conditions that accompanied the thumb-sucking were caused by the habits instead of those conditions being the bases of the habits. In other words, in these children there was not such an unusual inherent surplus of nervous energy that unusual outlets had to be provided for it. On the contrary, much of the surplus energy present was found to be the product of disordered physiologic states directly connected with the abnormal habits. In seeming contradiction to this view is the common observation that indulgence in thumb-sucking has an immediate soothing or pacifying effect. That is true, but it tells only part of the story. In the treatment of these cases, it was shown that, in this respect, the habit seemed to act not unlike a chemical sedative which has an immediately tranquilizing effect but takes its toll in after-results on mind and body. Why that was true, I must leave to more competent physiologists than I.

Fig. 8.—Roentgenogram of head showing normal nasal space. Case A, Fig. 6.

The first favorable general change noted in stopping the habits was more restful sleep. This change was invariably noted during the first few days and was permanent. While previously the children had roused at intervals to indulge the habits, they slept throughout the night and appeared refreshed in the morning. Several mothers stated that there were no longer the dark circles under the eyes which were common in their children on awakening. Improvement in appetite also came early in the treatment.

Probably owing to improvement in these two basic functions, favorable changes in the abnormal physical, nervous and psychologic pictures began to appear. In a number of instances, these consisted of marked increase in weight and accelerated growth. In some, there was a recognizable increase in bodily vigor and a desire to indulge in competitive sports and to play normally with other children. Throughout the reports of the parents are repeated statements that these children became more calm, more tractable, more progressive in school, happier and less given to temper and crying spells. Brief individual reports of two of the cases may serve to illustrate these findings.

REPORT OF CASES

Case 1.—A boy, aged 7, had developed the habit in the second month of life and it showed no signs of lessening, although the father had strenuously combated it during the intervening years. When the patient was first seen, at the age of 3, there were already present a wide open bite, narrowing of the arches and upward distortion of the palate. At the time treatment was begun, medical examination showed that the nasal septum was badly deflected and that there was much deficiency in the nasal space. This was and still remains apparent in speaking, the voice having the

characteristic lack of resonance accompanying partial occlusion of the nares. The rhinologist regarded complete surgical correction of these conditions as impossible. There was almost constant mouth-breathing, the mouth hanging wide open and giving the boy a stupid appearance.

The nervous and psychologic aspects of the case were accurately summarized by the mother, who stated that the child was a problem at home and abroad. Although having a fine inheritance of brains and poise, the boy did poorly in school and was unusually restless, disobedient and untrustworthy. The main symptoms noted at the office were almost continuous twisting and other movements of the body and lack of concentration. Because of these, it was with much difficulty that simple orthodontic operations were carried out. Although the patient was not rebellious, his head had to be held in position by an assistant while the operations were quickly performed.

Treatment resulted favorably in most of these respects. Within the first few weeks, there was noticeable lessening in the nervous tension and the consequent restlessness and abnormal bodily movement. Increase in power to concentrate and a more reasonable attitude toward receiving guidance and instruction at home and in school were commented on by the parents. After four years, it has meant much in betterment of the boy's physical well-being and personality.

Case 2.—A boy, aged 9 years, had practiced the habit continually for eight years during the day and most of the night. The most noticeable abnormal nervous phenomena were blinking of the eyes, sniffling and spasmodic contraction of the muscles of the right cheek while the head was drawn downward and to the right. There was also a nail-biting habit.

Just prior to the beginning of this investigation, the boy had been an orthodontic patient and the habit was being treated by psychologic methods, but without success. The nervousness became so aggravated that, on the advice of an internist, the boy was taken from school, relieved of all unnecessary duties and kept out in the open air as much as possible for a year. The orthodontic treatment was among the things prohibited. The habit, which was practiced for an unusual length of time and with unusual intensity, was regarded as one among the other results of some underlying physical ailment. This regimen was faithfully carried out, but, while it resulted in some physical improvement, there was little change in the nervous symptoms.

As, in the meantime, several of this group of thumb-sucking children had been treated with favorable results, the patient was called in and an appliance was put on, promptly stopping his habit. The case proved to be

Fig. 9.—Arch normal in width but 4 mm. upward palatal distortion. Case B, Fig. 6.

the perfect one for demonstrating the systemic effects of thumb-sucking. Within three months, most of the nervousness had cleared up and the boy was back in school, much improved mentally and physically. Removal of the appliance at that time proved to be too soon. During a temporary period of illness, the habit was resumed and the same nervous complex was revived. In a second period of treatment, lasting a year and a half,

the habit was permanently cured. With its elimination, the associated nervous symptoms again disappeared.

The nail-biting habit was not affected by the cure of the thumb-sucking. The fact that the same thing was noted in other cases indicated that while the two habits may be present, they are not connected, being the results of distinctly different neural stimuli.

CONCLUSIONS

1. There are three main abnormal forces exerted in thumb-sucking: (a) the passive force of the digit held between the arches; (b) abnormal contraction of the cheeks against the sides of the arches, and (c) abnormal muscular pressure of the digit against the palate. These forces begin in the plastic age of infancy and are often continued through the formative period of childhood.

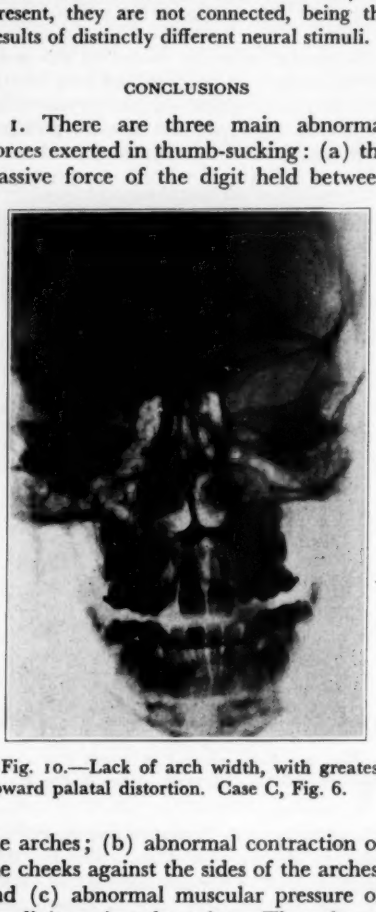

Fig. 10.—Lack of arch width, with greatest upward palatal distortion. Case C, Fig. 6.

2. In this group of children, the effects of these forces on the teeth were seen as high percentages of certain types of regional and of general malocclusion. Force "a" caused maxillary incisor protrusion, mandibular incisor retrusion and open bite of the incisors. Force "b" was found closely associated with narrow maxillary arches. The close association of force "c" with unilateral mesioclusion of the maxillary arch indicated that it is a cause of that type of general malocclusion. The cause for this condition has been unknown. The above-mentioned cases of high percentage malocclusion were all found fully established as early as 3 years of age. In most of the cases, the malocclusion was of such character that complete self-correction seemed extremely unlikely if the habits had ceased even at that early age. Taken together, these types of malocclusion caused by the habit in this group comprise a large proportion of cases of adult malocclusion. It appears, therefore, that this habit is one of the most important causes of malocclusion.

3. The malocclusion of the incisor teeth caused by thumb-sucking encourages abnormal habits of the lips and tongue, and mouth-breathing. All of these secondary habits tend to persist throughout life and maintain or exaggerate the malocclusion. Mouth-breathing often seriously affects the general health.

4. The abnormal forces of the habit distort the form of the structures of the internal face. In these cases, whenever the forces were exerted in the same direction as the inherent course of growth, there was overdevelopment. If they were in opposition to the normal process, underdevelopment in that direction was seen. They apparently inhibited lateral growth in the maxillary bone and positively prevented downward growth of the palate. These inhibitions of growth were found associated with less than normal width and height of the nasal space, deflection of the nasal septum and the con-

sequent pathologic manifestations of such abnormal conditions. There remain, I believe, only the questions of extent of deformity and the percentage of cases. Such nasal malformation often is incurable. It is common and is the source of much ill health. If thumb-sucking is a cause of these conditions, it is time that, as an important health measure, a more serious attitude be taken toward the habit.

5. Thumb-sucking causes definite and often serious nervous disturbances. The evidence of this was so common and so clear among these children that there can be no doubt of the fact. When practice of the habit was positively stopped by the use of mechanical appliances, the nervousness attending the habit was reduced or cleared up. If the habit was resumed, the same abnormal symptoms reappeared. Through nervousness, the habit exerts its influence on the general physical and mental processes. Its physical results may be such conditions as muscular tics, retarded growth, deficient weight or disordered bodily functions. Some of its principal nervous and psychologic consequences are unsound sleep, deficient appetite, abnormal restlessness, excessive crying, tantrums, lack of power to concentrate and unfavorable social behavior. There may be one outstanding symptom or a number of them in a given case. In this group, they were as apparent among the youngest children as among the oldest ones. The severity of the abnormal nervous phenomena was definitely related to the method, time and intensity of the habit. The nervous effects on the physical and mental well-being and personality were, in some cases, far more important than the structural ones.

A B

Fig. 11.—Views of appliance used to correct the habit.

6. The findings of this investigation can be verified in any dental practice. It seems, therefore, that dentistry, as guardian of the structures of the mouth and of the general health, should assume its special responsibility in preventing or curing these pernicious habits.

Medical Arts Building.

CONGENITAL ABSENCE OF DECIDUOUS AND PERMANENT TEETH

REPORT OF CASE

By Dell S. Gray,* D.D.S., Honolulu, T. H.

A REVIEW of the dental literature pertaining to the congenital absence of deciduous and permanent teeth leads to the conclusion that complete, or nearly complete, anodontia is very rare. The following cases are a matter of record. Other important cases may have escaped our notice.

Battersby,[1] reports the case of a child 9 years and 4 months of age with complete absence of dentition either deciduous or permanent.

S. H. Guildford[2] reports the case of a man, aged 48, who was said to have been edentulous from birth.

In 1904, at a meeting of the Odontological Society of Great Britain, William Rushton showed models and photographs of an Armenian boy, aged 16, in whom apparently no teeth had erupted.

F. R. Nager[3] reported a case of a boy, aged 8 years, with complete absence of dentition.

Gardner and Dillery[4] report the case of a boy, aged 15, with a congenital absence of twenty-three permanent teeth.

REPORT OF CASE

Dental History and Examination.—In May 1937, an American boy, aged 9 years, the son of a sergeant in the U. S. Army, reported to Tripler General Hospital. Both upper deciduous central incisors had been extracted, but no other deciduous or permanent teeth. There were congenitally absent six deciduous teeth and thirty permanent teeth. (Figs. 1 and 2.)

Fig. 1.—Model of mouth; showing two permanent incisors.

The structure of the deciduous teeth that were present was very good. The upper arch was narrow and there was marked prognathism, all of the inferior teeth occluding labially. The two permanent teeth yet to erupt were very rudimentary, as can be seen in the roentgenograms. One other child in the family, who died at 13 years, had, according to the mother's report, a normal dentition with the exception of failure of either of the upper lateral incisors to erupt.

Examination of the mother, aged 44, revealed the congental absence of all third molars and both upper lateral incisors. The father, aged 47, had a normal dentition with

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the exception of congenital absence of all third molars.

Medical Service Report.—There were two children from the union. The older brother died at 13 years of age from what was diagnosed as streptococcic infection of the throat. The patient was a normal full term child and his birth was entirely normal. He was normal as a baby and walked and talked at the usual time. Nothing unusual occurred in his mother's condition during pregnancy. The child had chickenpox at 1 month of age. September 29, 1936, he developed some fever and paralysis of the muscles of deglutition, later diagnosed as a streptococcic infection of the throat.

Laboratory Findings.—The eye examination showed the fundi normal and 20/20 vision bilaterally. The ears and hearing were normal. The nose, throat, larynx and pharynx were normal. A roentgenogram of the skull revealed a normal sella, but the impression of the roentgenologist is that the size of the skull and the *impressiones digitatae* were strongly suggestive of hydrocephalus. The urine was negative. The blood picture showed a mild secondary anemia. The white cell and differential counts were not unusual. The Wassermann and Kahn tests were negative.

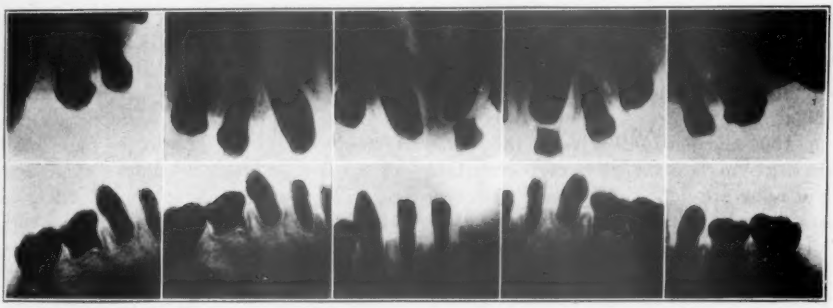

Fig. 2.—Roentgenogram, showing number of congenitally absent teeth.

Physical Examination:—The patient was an apparently normal, healthy appearing child of about the normal height for his age, but slightly underweight. The shape of the head suggested a mild hydrocephalus. The skin was clear and healthy. The tonsils were small and gave some evidence of inflammation. There was no adenopathy. The eyes showed no abnormality. The heart, lungs and abdomen were negative. The development in general seemed normal. The mother believed that there was possibly some slight defect in hearing, but it could not be noted. The patient had never complained of headaches, ate well, had a balanced diet and never had had any gastrointestinal disturbances. His mother believed that he had no symptoms or complaints of any kind and his school work was about normal for his age.

There was nothing in the child's history or the physical or laboratory findings to suggest any etiologic factor in his dental abnormality.

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CENTRAL OSTEOMAS AND CEMENTOMAS: DIAGNOSIS AND TREATMENT

By KURT H. THOMA, D.M.D., Boston, Mass.

MAXILLARY bone and cementum are closely related. Both originate in connective tissue, the mandible and maxilla being so-called membrane bones. Their descent from a common parentage can be demonstrated in the development of the parodontal tissues. The dental follicle, a connective tissue membrane surrounding the enamel organ and dentinal papilla, forms cementoblasts on the root side and osteoblasts on the alveolar side, from the same mesenchymal cells. Ultimately, cementum and bone are deposited toward its center so that only a thin structure, the peridental membrane, remains. This similarity in origin accounts for the differences in structure of subapical calcified tumors, which may form cementicles and trabeculae that vary from primary cementum to osteocementum and true bone.

Besides this genetic factor which cementum and bone have in common, it should be kept in mind that both develop in preformed connective tissue and that, in neoplastic formations, the mesenchymal cells proliferate and produce cells which either tend to differentiate into osteoblasts when osteomas form or into cementoblasts when cementomas result. The soft tissue in these tumors is the primary and active neoplastic part, and therefore the proportion of soft cellular tissue to calcified intercellular structure may vary according to the cellular activity and age of the tumor.

(Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Ninth Annual Session of the American Dental Association, Atlantic City, N. J., July 15, 1937.)

Furthermore, the stage of differentiation reached by the tumor cells may vary in these benign tumors just as it varies in the malignant form, the osteogenic sarcoma. In the rapidly forming neoplasms, we often see at one time all stages of transformation of fibroblasts into bone cells, each developing its characteristic intercellular structure. In some parts, therefore, we may find areas of fibrosarcoma, myxosarcoma or chondrosarcoma. In others, the cells may have progressed to the osteoblastic stage and osteoid tissue or bone is formed, either as uncalcified or as calcified anastomosing trabeculae. With so many tissue structures present at one time, only compound histologic terms could be used to name the tumor. As these are of little practical value, a general term, osteogenic sarcoma, has been suggested and is used to include all the microscopic types.

Similar morphologic development may be found in the slowly growing osteoma and cementoma, except that generally only one type of development is observed at one time, as the changes are very slow and cannot be directly followed in one specimen. This is because all the active cells have had time to be developed to the same stage of transformation. Thus, the tumor shows for a long period, if not during its entire existence, uniform histologic structure. It may therefore be classified according to its histologic appearance, be it temporary or permanent.

CEMENTOBLASTOMA

The cementoblastoma, which is a neo-

plastic development from either the dental follicle or the peridental membrane, is always a central tumor and may be seen in the following stages: (1) fibromatous stage, (2) cementicle-forming stage and (3) cementoma.

1. *Fibromatous Stage.*—The cementoblastoma is made up entirely of soft tissue, and is often mistaken in roentgenographic examination for an area of periapical infection, as has been pointed out by Stafne (1935), because the tumor produces an osteolytic effect in the subapical region of the jaw. (Fig. 1.)

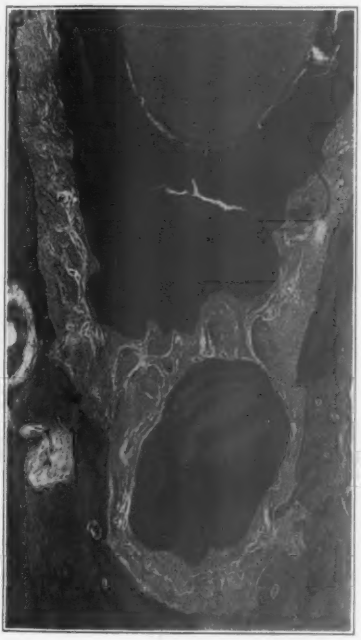

Fig. 1.—Cementoblastoma (in woman, aged 42), forming in subapical area with cementicle in center, and apical hypercementosis.

2. *Cementicle-Forming Stage.*—Cementicles at first can hardly be identified in a roentgenogram. They grow by concentric additions and later fuse, producing an adherent radioparent mass. (Figs. 1 and 3.) In other cases, the cementum is laid down as trabeculae (Fig. 4) that more or less resemble bone (osteocementum). Cementum is differentiated from

Fig. 2.—Cementoblastoma in a woman aged 54; showing subapical cementomas in anterior part of mandible; photomicrograph of hypercementosed apex of left second incisor, showing haversian canal and adjacent tumor.

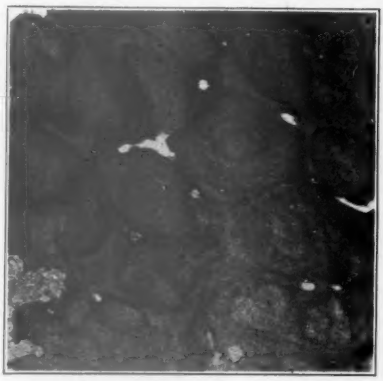

Fig. 3.—Cementoblastoma; photomicrograph of section through tumor shown in Figure 2. The cementoblastoma is made up of fused concentric cementicles with very little soft tissue present.

bone by its granular and irregular calcification, containing transversely placed connective tissue fibers and typical cement corpuscles with long processes in twisting canaliculi. However, it may be atypical in neoplastic formation (Fig. 5), when it is difficult to recognize.

3. *Cementoma.*—In the actively growing stage, the cementoma is encapsulated by the connective tissue in which it is formed. In the mature stage when growth has been arrested, this tissue remains as a thin membrane, which can be recognized in the roentgenogram as a

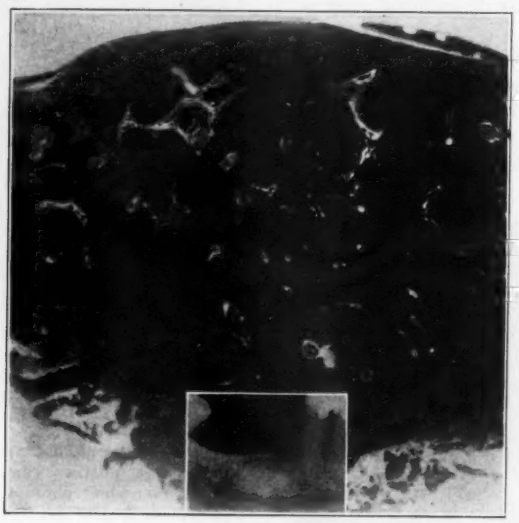

Fig. 4.—Cementoblastoma in a woman of middle age. The roentgenogram shows the cementoma which existed before extraction of the molar. The photomicrograph shows the tumor to be composed of trabeculae of osteocementum with marrow spaces containing fibrous connective tissue.

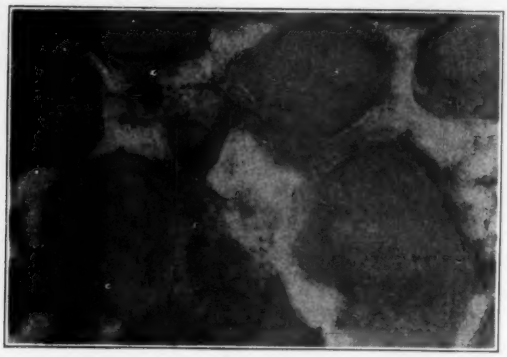

Fig. 5.—Cementoblastoma in a boy aged 17. The photomicrograph of this large mandibular tumor shows atypical round trabeculae of cementum fused in places, but separated by connective tissue.

narrow dark shadow around the calcified part of the tumor. The marrow spaces of the cementum are filled with fibrous connective tissue in which small new cementicles are often formed.

Cementoblastomas may remain small or may develop to considerable size, when they are apt to expand the bone. (Fig. 6.) They have the tendency to appear as multiple tumors, and are often found in both jaws of a patient. Hypercementosis may occur on those teeth that are in contact with the tumor. (Fig. 2.) Change to malignancy has not been reported.

Roentgen Examination.—The appearance of the tumor depends on the stage

Fig. 6.—Cementoblastoma in a woman aged 54; cystic area containing cementomas. The mental fossa showed expansion.

of its development. In the fibromatous stage it is radiolucent, as has been stated. When mature, it forms a radiopaque area surrounded by a shadow the thickness of which depends on the amount of connective tissue surrounding it. (Fig. 6.) In the inactive state, this shadow becomes merely a thin dark line. (Fig. 4.)

Treatment.—Excision is indicated if the tumor is large, and expands the bone, and especially if it contains a great deal of fibrous tissue. (Fig. 6.) Small tumors, particularly if they have reached the inactive stage and would require the removal of sound, useful teeth, may be kept under observation. Actively growing ones, however, should be excised in order to prevent the loss of a greater number of teeth in case of spreading of the tumor. Generally the tooth or teeth in direct relation to the cementoma must be extracted or treated, as excision of the tumor destroys their blood supply.

OSTEOMA

Osteomas form either peripherally or inside the bone, and this at once distinguishes them from osteogenic sarcoma, which generally shows both central and peripheral involvement. (Fig. 7.)

Peripheral Osteoma.—The peripheral osteoma is distinguished from an area of exostosis (which grows from the cortex as an extension and is composed of dense and uniform bone) by its expansive growth. It contains definite marrow spaces and is mentioned here only for the purpose of comparison. I pointed out in a special paper (1937) that the *torus palatinus,* which when small is considered the product of an exostosis, takes on the features of an osteoma in its larger and lobulated forms. The true peripheral osteoma, however, occurs as the osteoma durum, with an eburnated surface composed of a thick cortex and dense center containing only small marrow spaces, which decrease in size on account of bone-forming activity in the fibrous marrow. These osteomas have a tendency to occur in multiple form and often are symmetrically distributed. A case of multiple osteoma involving the ramus, body of the mandible and maxillary sinus was reported by me recently. (1936.)

Central Osteoma.—Central osteomas are more common and have been variously classified as the product of localized osteitis fibrosa, hypertrophic localized osteitis or a localized osteodystrophia fibrosa, or as ossifying fibroma, osteofibroma, fibrous osteoma or osteoid

Fig. 7.—Osteogenic sarcoma in patient aged 25; showing bone tumor with both central and peripheral involvement.

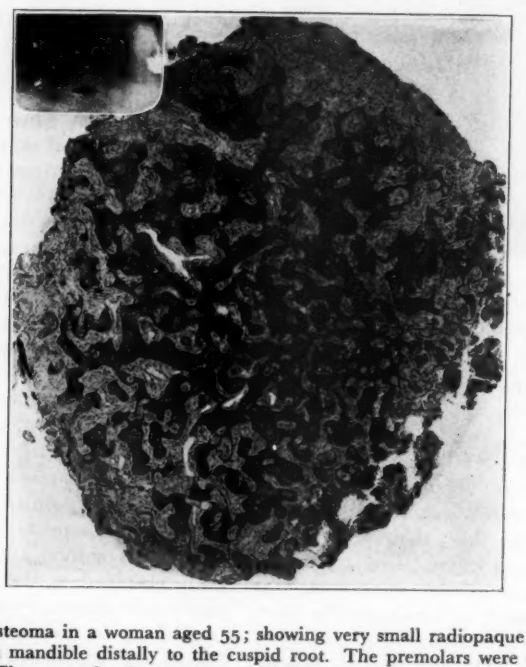

Fig. 8.—Fibro-osteoma in a woman aged 55; showing very small radiopaque area surrounded by dark shadow in mandible distally to the cuspid root. The premolars were extracted several years previously. There was local soreness and slight discomfort. The photomicrograph shows the complete section through the tumor.

osteoma. The reason for all these names is easily understood when we consider the varied appearance, the changeable proportion of soft and hard tissue and the variation caused by the cell differentiation described above. We may recognize (1) the fibromatous stage (central fibroma), (2) the ossifying stage (ossifying fibroma) and (3) fibro-osteoma: (a) fibro-osteoid osteoma and (b) sclerosing fibro-osteoma.

Fibromatous Stage: This stage of the central osteoma corresponds to the fibromatous stage of the cementoma and may be a true central fibroma being transformed. Siegmund and Weber (1926) state that the central fibromas of the jaw

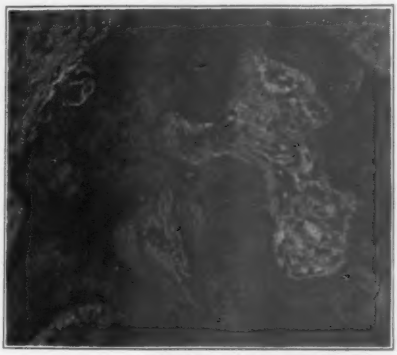

Fig. 9.—Fibro-osteoma shown in Figure 8, with higher magnification to show fibrous marrow and bone trabeculae with characteristic curvilinear markings due to resorption and apposition.

may ultimately be transformed into an osteoma or even a cementoma.

Ossifying Stage: In the incipient fibromatous lesion, bone is formed. On account of the overabundance of fibrous tissue found at this time, Phemister and Grimson (1937) have suggested the term ossifying fibroma. The lesions are generally circumscribed and are radiolucent at first. As bone is deposited more abundantly, they become more and more radiopaque. The small tumor of this type shown in Figure 8 demonstrates that the lesion, even if small, may be made up of trabeculated bone (osteoma spongiosum), as shown in Figure 9.

In other cases, the fibrous tissue may develop in the marrow spaces replacing the normal spongiosa without the production of a proportionate amount of neoplastic bone. Such tumors also may be radiolucent, but often show little change in radiability. They are generally of diffuse character, involving a considerable area. They cause local expansion and later general enlargement of the entire bone.

Fibro-Osteoma.—In the fibro-osteoma, the spongiosa has been transformed by the

Fig. 10.—Fibro-osteoma in a girl aged 14 who complained of asymmetry of lower jaw. The roentgenogram shows expansion of bone with definite radiolucent areas in the submolar area.

cellular activity of the fibrous marrow (Fig. 11), the old trabeculae being gradually resorbed and replaced by bone of different architecture and sometimes of different quality. This is well illustrated in sections by the presence of curvilinear markings which are evidence of resorption and new formation. (Fig. 9.) If the process continues indefinitely, the bone becomes enlarged and facial deformity results. (Figs. 13 and 16.)

The terms localized osteitis fibrosa or osteodystrophia fibrosa are not in keeping with the pathologic condition found. In the first place, we have no primary osteitis as we find it in osteitis deformans (Paget's disease), and, in the second place, the terms designate a transformation, but not an expansive new formation which we actually see. Phemister and Grimson (1937) selected the name fibrous osteoma for their cases. Although I classified my cases as localized osteitis fibrosa in my text, "Clinical Pathology of the Jaws" (1934), I have since changed my opinion, favoring fibro-osteoma as used by Furedi (1935). The term describes the

Fig. 11.—Fibro-osteoma in a woman aged 45 who complained of expansive enlargement of tuberosity of five years' duration. The roentgenogram shows changes in the bony architecture causing a typical radiopacity.

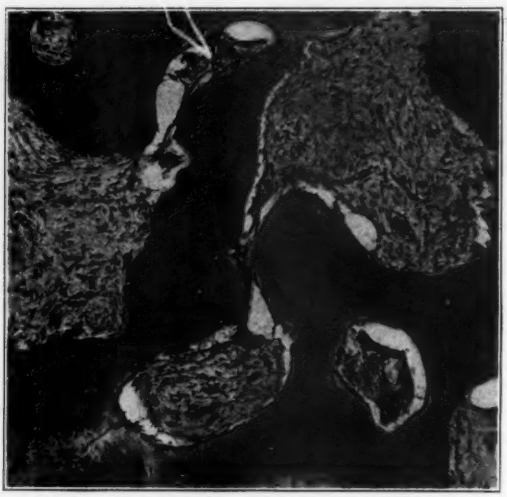

Fig. 12.—Fibro-osteoma; photomicrograph of bone excised from case in Figure 11; showing fibrous marrow and bone trabeculae surrounded by osteoblasts.

pathologic findings quite accurately, and designates the lesion as a benign tumor.

VARIATIONS

The newly formed osseous structure may be composed, however, of poorly calcified osteoid tissue and then should be called fibro-osteoid osteoma in accordance with Jaffe's classification (1935) of skeletal osteoid osteomas. They form a definite clinical entity easily recognized at operation. The bone in these cases is soft and can be cut like Ivory Soap, with a knife or a curet. The case shown in Figures 16-18 was of this type. Higher magnification of the microscopic section shows definitely osteoid substance deposited in the fibrous tissue, which may become partly calcified. (Fig. 18.) Osteoid areas may also be seen adjoining old, partly resorbed trabeculae.

Fig. 13.—Fibro-osteoma in a girl aged 13 who complained of asymmetry of inframandibular line.

Fig. 14.—Fibro-osteoma; roentgenogram of case shown in Figure 13, showing expansion of bone and thinning of cortex. Radiolucent areas are seen surrounded by more radiopaque bone.

Fig. 15.—Fibro-osteoma; photomicrograph of bone excised from patient shown in Figure 13. Fibrous marrow and bone trabeculae with typical curvilinear markings due to resorption and new formation can be noted.

In the sclerosing fibro-osteoma, the neoplastic bone is hard and dense, being normally calcified but formed in excess, so that the marrow spaces are decreased

in size. (Fig. 19.) In microscopic sections, the bone trabeculae show the characteristic curvilinear markings, evidence of resorption and replacement of bone, which distinguishes the tumor from ordinary sclerotic bone. (Fig. 20.)

DIAGNOSIS

Clinical Findings.—The disease occurs more frequently in women than in men. The onset generally occurs in the second and third decade. Asymmetry of the face or disturbance of the occlusion are the chief complaints that bring the patient to the clinic. Because there is no pain in most cases, the patient usually will seek treatment only after prolonged existence of the tumor. The disturbance may at first be intra-oral, enlarging the tuberosity (Fig. 11), or the palate may expand. The oral mucosa covering the area of swelling is normal in such cases. In other patients, the surface of the face becomes expanded, particularly the zygomatic region. (Fig. 16.) Occasionally, the floor of the orbit may be raised, the eye on the affected side having a higher level as a result. The mandible may show convexity of the lower border (Figs. 10, 13, 14), and lateral deformity. The growth may encroach on the nasal cavity and difficulty in breathing may result.

The growth is slow and the tumor remains benign, but it is liable to recur after incomplete operation, although arrest of further development has been reported in such cases.

Serologic tests, calcium and phosphorus determination and urine analysis reveal no abnormal condition related to the disease.

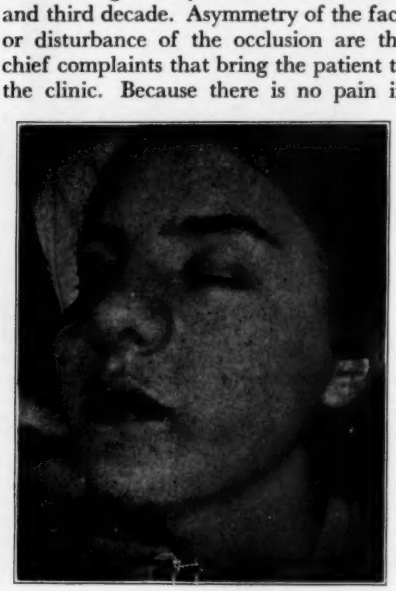

Fig. 16.—Fibro-osteoid osteoma in a girl aged 16 who complained of marked expansion of zygomatic part of face on right, first noticed six years previously.

Fig. 17.—Fibro-osteoid osteoma; roentgenogram of patient in Figure 16; showing on right side radiopacity of maxillary sinus extending into the malar bone.

Roentgenographic Examination.—If only part of the bone is affected, the area may be circumscribed. The roentgenogram then shows the shadow of the connective tissue capsule. In most cases, the change is diffuse in character, without distinct demarcation. The cortex may be thinned out (Fig. 14) and the maxillary sinus may be obliterated. (Fig. 17.) In other cases, enlargement or expansion of the bone can be visualized better in the

roentgenogram than in clinical examination. Expansion of the lower border of the mandible is sometimes the only change that can be demonstrated. (Fig. 10.) The fact that no periosteal formation occurs helps to distinguish the fibro-osteoma from osteogenic sarcoma. (Fig. 7.)

In the fibromatous stage, the tumor tissue shows osteolytic changes (Fig. 14), and the affected area is also more radiolucent in the fibro-osteoid osteoma. In the fibro-osteoma, the density may be greatly increased owing to the more complete calcification of an increased number of trabeculae; or it may appear entirely sclerotic because of obliteration of the marrow spaces. In some roentgenograms of fibro-osteoma, typical stippling may be seen, in an arrangement that reminds one of an orange peel. Figure 11 only suggests it and gives the idea of concentric arrangement with peripheral extension. In other cases, both osteolytic and osteoblastic areas may be found. (Fig. 19.)

The maxillary sinus, if involved, appears dense, with extension of the tumor into the malar bone, an important sign of differentiation. (Fig. 17.)

The relation of the teeth to the tumor plays no direct part in the disease, as it forms in the presence of normal teeth as well as in areas where teeth have been lost. (Figs. 10 and 14.)

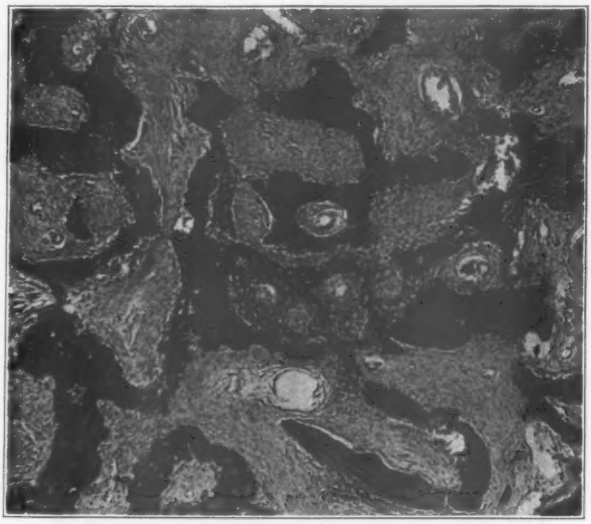

Fig. 18.—Fibro-osteoid osteoma; photomicrograph of bone excised from patient shown in Figure 16. The irregularly resorbed bone trabeculae are surrounded by dense fibrous connective tissue. This is transformed into osteoid tissue.

TREATMENT

In circumscribed cases, total excision is most always possible and desirable, if it can be accomplished without loss of any important structure. It prevents more serious involvement of larger parts of the jaw. One should be conservative in cases of the diffuse type and when large parts of the jaws are involved. Conservative operation is advised because no malignant transformations have so far been reported. In some patients, it may be advisable not to interfere at all, although a biopsy should always be made to establish the benign nature of the individual

case. Such patients, however, must be kept under observation. Irradiation of the parathyroid glands was tried in one of my cases, although there was no indication of hyperparathyroidism. The tumor, however, was not affected and continued to grow. Disfiguring operations are not justified. Blum, Phemister and Grimson recommend partial excision, removing the tumor as thoroughly as possible without incurring the danger of a poor esthetic result. This has been my own attitude and procedure. As further protection, the patients should receive postoperative irradiation of about 3,000 roentgen units given over a protracted period of time. In spite of this, the tumor may continue to grow and may require secondary operation, or finally complete resection.

Fig. 19.—Fibro-osteoma in a woman aged 70 with swelling of jaw. The roentgenogram shows radiolucent areas in the body of the mandible with radiopaque bone near the alveolar ridge.

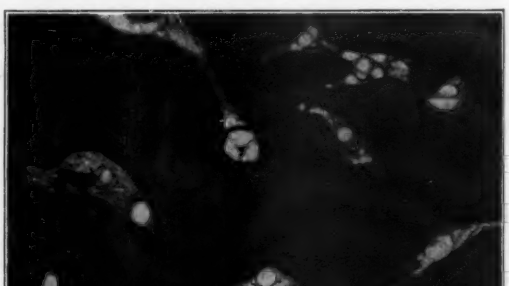

Fig. 20.—Fibro-osteoma, sclerosing type. Bone excised from the alveolar part of the mandible (Fig. 19) shows, on microscopic examination, large trabeculae with decreased marrow spaces containing fibrous marrow. The curvilinear markings in the bone are characteristic of fibro-osteoma.

SUMMARY

The various benign ossifying tumors considered here are all closely related, but each must be distinguished by differential diagnosis from the others as well as from the malignant osteogenic sarcoma.

Cementomas and osteocementomas are very slow growing, except when they contain a great deal of cellular structure. They should be removed if there is indication of continuous growth; but if in the inactive mature stage, they may be retained and kept under observation.

Osteomas occur peripherally as well as intra-osseously. In the latter form, they develop in the second or third decade of life and are called fibro-osteomas. They tend to grow slowly, ultimately disfiguring the face, obliterating the vault of the palate and encroaching on the maxillary sinus. Since they are benign, disfiguring operations are not indicated, but conservative partial excision followed by postoperative irradiation is advised.

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47 Bay State Road.

THE FRENUM LABII SUPERIORIS

By Enayat Shirazy, D.D.S., Philadelphia, Pa.

WHILE considerable material appears in medical and dental writings concerning the frenum labii superioris, these contributions are scattered and fragmentary and entail tedious search of the literature. No single publication includes the sum total of information contributed by investigators and clinicians on this subject. As a matter of fact, knowledge of the genesis and the morphology and pathology of the lips of man is inadequate. This part of the human anatomy appears much neglected and requires further extensive research and study.

I have encountered numerous difficulties in searching the literature in an effort to become better acquainted with the subject of the lips of man.

The frenum labii superioris may be abnormally developed from hypertrophy with or without the definite separation between the first maxillary incisors, known as a diastema.

At birth, the frenum reaches the incisive pad (papilla palatina) which is situated in the midline in the anterior aspect of the palate. With the eruption of teeth and the formation of a definite alveolar ridge, the position of the frenum, in the majority of persons, is in the midline of the mucoperiosteum covering the alveolar ridge a short distance above the gingival line of the maxillary incisors. The growth of the alveolar ridge appears to affect the labial position of the frenum.

The mammals are the only animals in which the lips are separated from the alveolar arches. A diastema between the first maxillary incisors with a frenum labii superioris extending between the teeth as far posteriorly as the papilla palatina is a normal condition in Prosimiae. The true lemurs (Prosimiae) are native

to Madagascar, and are probably the ancestors of many different mammals. The anterior portion of the maxillae and lips of the brown lemur are shown in Figure 3, page 257 of Bolk's[1] contribution on the morphology and genesis of the mouth, entitled "Ueber die Gaumentwicklung und die Bedeutung der oberen Zahnleiste beim Menschen."

The condition known as abnormal frenum labii superioris is a congenital anomaly depicting in man the retention of a feature of an early stage of development in his evolutionary genesis.

Herbst and Apffelstaedt[2] suggest that this diastema may be due to hyperplasia of the premaxillary element of the maxillae or to an increase of space in the alveolar ridge of the anterior portion of the maxillae due to want of development of the second maxillary incisors. He further asserts that "whether the frenum is actually the cause or an accompanying symptom, will be left as an open question."

According to Schwartz and Abbott,[3]

Bolk in a careful study of the morphology of the structures of the mouth demonstrated that in the development of the vestibulum oris the frenum is pushed up as an intermediate bridge. He pointed out that at one stage of development the upper lip is in reality divided into a right and a left lip—a situation also present in some of the adult lower primates. A widening of the frenum, said Bolk, should be regarded not as a hypertrophy but as a developmental defect in which the fusion of the two sides of the vestibulum oris has not been completed. In persons with such a condition the tissue strip in which the teeth develop is equally incomplete.

Referring to the genesis of the "frenulum," Boyd[4] states that "the frenulum appears to be developed from the frontonasal process, that is, it presents the nonformation of the labio-gingival sulcus."

The frenum of the lip consists[5] essentially of a very vascular connective tissue covered with stratified squamous epithelium similar to that of the oral cavity. No muscle fibers are demonstrable in sections made from the frenum.

While the treatment[5, 6] advised for correcting this anomaly has been surgically moving the frenum into its proper position on the labial aspect of the alveolar mucoperiosteum, followed by orthodontic measures to correct the diastema when present, Schwartz and Abbott rule out surgical intervention on account of the scar tissue which follows operation, preventing adequate orthodontic approximation of the separated first maxillary incisors.

I favor the method of Schwartz and Abbott, but I suggest that the ideal treatment is to correct the diastema by orthodontic means and to surgically establish the position of the frenum while the orthodontic appliances are still in position. The scar tissue developing after obliteration of the diastema should unquestionably aid in keeping the first maxillary incisors in proper approximation. The proper time for correcting this unsightly deformity is after the permanent maxillary incisors and cuspids have completely erupted.

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Medical Tower.

BETTER NITROUS OXIDE-OXYGEN ANESTHESIA

By K. C. McCarthy, M.D.,* Toledo, Ohio

NO mention will be made of the indications for, or advantages of, nitrous oxide anesthesia in oral surgery. Instead, the common difficulties met with in the administration of nitrous oxide and oxygen will be emphasized, and methods outlined for their prevention and treatment.

Nitrous oxide anesthesia in oral surgery presents special difficulties. It is complicated, first by the open mouth, through which the patient may inhale air which dilutes the anesthetic, and the oxygen of which neutralizes the nitrous oxide. It is difficult, therefore, to maintain smooth anesthesia; for even one breath of air will, in many cases, bring the patient out of surgical anesthesia into the excitement stage, with which, unfortunately, most of us are familiar. The inhalation of air may be prevented by use of the throat pack, and by delivering the gases under pressure. The pack must be large enough to prevent the ingress of air, yet, at the same time, it must not be so large as to obscure the operative field or obstruct the respiration. Furthermore, inefficient packing will permit the blowing of blood from the mouth in a manner damaging to the temper and the wallpaper.

Pressure insufflation of the anesthetic gases is probably the most important factor in excluding air and maintaining smooth anesthesia. If the gases are blown into the nasopharynx under a pressure greater than atmospheric, it will be impossible for air to enter, the tendency being rather for nitrous oxide to escape through the mouth. Thus, smooth anesthesia can be maintained indefinitely even for tonsillectomies, in which a pack cannot be used. Neglect of this matter is, I believe, responsible for 95 per cent of the failures associated with dental anesthesia.

Maintenance of anesthesia by pressure insufflation for prolonged periods with the mouth open entails some expense, because much gas escapes through the mouth and is wasted. The use of a pack that really blocks off the mouth will reduce this waste. A properly adjusted re-breather will also be helpful in conserving gas.

The second great difficulty in dental anesthesia is asphyxia, which may be caused by manipulations of the surgeon obstructing the airway, or by the patient's slipping into a position in which respiration is difficult. Respiratory embarrassment or inefficient breathing must be immediately corrected, for even quite minor degrees of obstruction can cause grave symptoms.

ENDOTRACHEAL ANESTHESIA

In the accompanying pictures, there will be illustrated methods for maintaining anesthesia and overcoming asphyxia that must be familiar to all.† In addition, the application of endotracheal anesthesia to oral surgery has been illustrated. The endotracheal technic has three principal advantages: 1. Respiratory obstruction is effectually prevented. 2. Air is excluded from the anesthetic mixture. 3. Aspira-

(Read before the American Society of Oral Surgeons and Exodontists, Atlantic City, N. J., July 9, 1937.)

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†This portion of the lecture was illustrated by a motion picture.—Ed.

tion of blood and other foreign material is impossible.

Endotracheal catheters may be of different materials and passed by various methods, but we shall consider only the blind transnasal method of Magill, which has many advantages. Very light anesthesia can be used, and the catheters are cheap, cannot easily kink or be bitten and can be made at home. There is no interference with the surgeon working in the mouth. No laryngoscope or other apparatus is ordinarily necessary and the method may be carried out with equal ease in office, hospital or home. The catheters used are made from commercial red rubber tubing, varying in size from 9 to 12 mm. outside diameter, and 25 cm. long. They are kept coiled in a round box (a motion picture film box gives the right curve) and have at one end a bevel, cut at an angle of about 30 degrees. The distal end is pierced with a safety pin to keep the catheter from disappearing inside the patient.

The anesthesia is induced in the usual manner, and when a satisfactory plane has been reached, the face mask is removed and the well-lubricated catheter of the largest size that will go in the nose is introduced through the larger naris. The catheter is passed backward, and is kept as close to the septum as possible so that the tip will not become entangled with the turbinates. When the proximal end is in the vicinity of the larynx, it is found that the patient will breathe through the tube. At this point, the mouth and the other nostril are covered so that all respiration is through the catheter.

When the tube is over the larynx, an attempt is made to introduce it during inspiration. If this is successful, there is usually a cough and characteristic tubular breathing heard through the catheter. If the patient does not breathe through the catheter, it is not in the trachea. If unsuccessful at the first attempt, one should persist, reanesthetizing the patient from time to time should he show signs of recovering. It has been found helpful in difficult cases to let the proximal end of the catheter rest on the cords, which promptly go into spasm. This is terminated by an energetic gasp, during which the catheter may be introduced.

Magill's "sniffing the air" position of the head is useful in getting the larynx into line with the nasopharynx. Thus, the supine position with a pillow under the head has advantages over the sitting posture. In some cases, a deviated septum or an abnormality of the nose or throat will cause difficulty. In these patients, the larynx is exposed with a laryngoscope and the tube is introduced and under direct vision. It is usually found that the difficulty lies in the use of a catheter with a faulty curve or of too large caliber, or one that is poorly directed, owing to the fact that the nose is crooked or the larynx is of an infantile type, which is difficult to intubate. We find it necessary to resort to laryngoscopy in about 5 per cent of cases.

Technic.—After the tube is in position, it is connected with the gas apparatus by the use of an adaptor or by simply covering the end of the tube with the nasal inhaler. The administration from this point on is greatly simplified. Much better relaxation is obtained. There is not the blowing of blood in the throat which frequently annoys the surgeon, and the gas consumption is reduced to a minimum, because, at all times, satisfactory re-breathing is obtained and little gas is wasted.

If a catheter is selected that does not fill the larynx, the throat can be packed off without any fear of obstructing breathing, and the aspiration of blood is effectively prevented. No manipulation by the surgeon or malposition of the patient can produce asphyxia. Quiet, efficient breathing continues throughout the operation in spite of tongue depressor or suction. The anesthesia, being delivered directly to the lung, is much more effi-

cient, and even small children who frequently give considerable difficulty under a pure gas technic can be handled with ease. Also, it is so effective in handling the muscular, resistant type of patient that we have practically dispensed with the basal narcosis formerly used in such cases.

In the supine position, the endotracheal technic overcomes the blowing of blood and the danger of respiratory obstruction, which are its main disadvantages.

CONCLUSIONS

The maintenance of general anesthesia with nitrous oxide should not be difficult, for there are only two dangers to be considered: overdosage and asphyxia. When we have gained sufficient familiarity with the signs of anesthesia to tell at a glance, without stopping to think, the exact plane in which the patient is at any given time, we have mastered 70 per cent of the subject. The instant recognition and correction of even minor degrees of respiratory obstruction complete our study. The endotracheal administration of nitrous oxide is a convenient method of obtaining better anesthesia and preventing respiratory obstruction.

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A CONSIDERATION OF THE ANTERIOR FIXED REPLACEMENT; SUGGESTING A SIMPLIFIED METHOD OF MAKING DIRECT PINLAY ABUTMENTS

By WALTER A. SCHILKE, D.D.S., Englewood, N. J.

IN presenting this subject, I direct my remarks to the general practitioner for the purpose of provoking discussion to ultimately benefit the unfortunate person who has lost a tooth, particularly an anterior one, and to offer aid in making a simple, practical, time-tried abutment for stationary anterior replacements.

In our observations of people in every walk of life, we continually note the appalling number who present themselves to others in their social sphere and to the world at large with marked dental deficiencies, correctable malformations and edentulous spaces in the visible portions of the dental arch. We find these conditions prevalent from the poorest laborer up to the fine, intelligent, well-groomed and most respected citizen of the community.

Each of us should have grave concern over this condition; not so much over whether those affected care how they appear, but over their mental attitude toward it. Why do they neglect a thing that depreciates and offsets their every effort to become healthy and civilized? They choose to acquire and use all the measures available, such as automobiles, a home well equipped with radios and oil burners and refrigerators to protect their health, to say nothing of permanent waves, manicures, facials, especially designed shoes, girdles and other clothes, to effect this civilized result. For appearance, comfort, pleasure and health, they willingly pay good prices, sometimes to

(Read at the Greater New York Dental Meeting, New York City, December 8, 1937.)

the point of physical breakdown, because the results are what they desire.

On inquiry, we find that laymen have built up several definite reasons for not having anterior, as well as posterior, dental deficiencies corrected. The first excuse usually is that they are afraid of pain. They think that it would be unbearable, not necessarily because of any previous experience, but because they have been told that dental operations hurt. In the same breath, they will say that dental care costs too much and they cannot afford it. Of course, they do not say this to the "beautician" or the refrigerator salesman. Their statement is usually followed by a description of some one whose appearance is ruined by a display of metal in the mouth. They forget their own edentulous appearance. Then, there is the young woman who just can't stand the idea of false teeth. They offend her and would greatly embarrass her. There are many other excuses offered as a salve to the conscience, but these few reasons cover the complaints we hear most regularly.

It may be that their reasoning is correct. It seems so, when we observe the large interproximal spaces in the faces we see. The serious part of this situation is that we practitioners are apparently standing by and assuming that, economically and in the matter of health, the loss is the patient's. It may be that they reason "A million procrastinators can't be wrong."

As members of the dental profession, we cannot disregard this serious health menace. On the contrary, it is our duty to apply the knowledge in our field to more thoroughly and systematically examine and study the individual restorative case before starting correction. Reactionary attitudes, then, cannot be assumed because of the kind of service to be rendered those on whom we do operate.

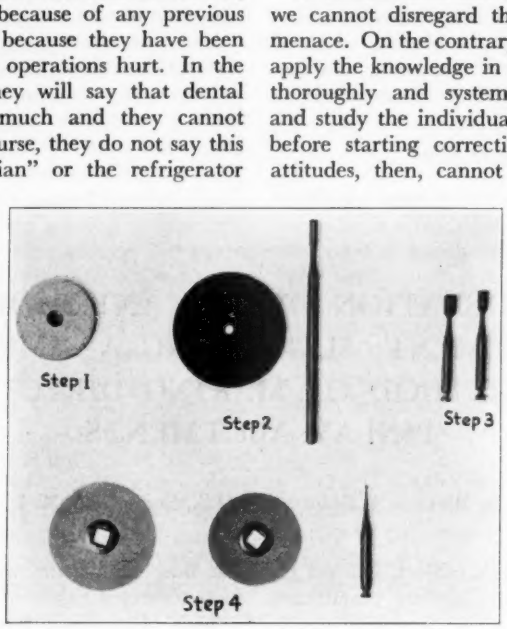

Fig. 1.—Instrumentarium.

Today, as a result of research, we find ourselves much better equipped, and when this knowledge is applied, preventive measures can be instituted in every type of mouth, with or without mechanical restorations, from those with the simplest erosions to those requiring the most complicated functional appliance. But for the one afflicted with loss of the teeth, we must make readily accessible that simple, esthetic, practical type of service which he receives at the hands of all the other beauty and health special-

ists; in order to restore these mouths to normal function.

I believe the greatest factor in the low rating given our science is the overwhelming number of lost teeth. The cause is undoubtedly the fact that, in our anxiety to repair decayed dental structures, we overlook, to a degree, the loss of such contact of the teeth of both jaws as will, without producing trauma, provide the highest efficiency during the excursive movements of the jaws and which is essential to the function of mastication (functional occlusion). The result is that we are unable to impress the patient with the importance of every individual tooth. We are too prone to forget that teeth have definite shapes and positions in the balanced arch because of certain uncontrollable inculcated tendencies. It is a natural law that the teeth shall be deformed and displaced according to the transgressions of the law by the individual and his ancestors; and also that the teeth shall be exfoliated by resorption in due time according to hereditary and personal tendencies. It is for this reason that a thorough examination of the patient is made, to insure that there is adequate circulation in the supporting tissues, before any type of stationary or removable dental restoration involving the interproximal space and shape of the line angle contact and occlusion is carried out.

Before deciding on the type of bridge replacement to be made, we should obtain all of the information possible concerning the patient. Our assistants should chart all the personal and general family history, including the age, weight, type, general health, previous sickness and operations, oral habits and occupational and social status. Having thus surveyed the case, we can invariably decide at once whether we have an approachable intelligent individual to deal with and what racial characteristics are present. Here, our problem begins. The probable reason for the unfavorable, unsightly results frequently obtained is that we are often too intent on presenting an agreeable personality, in order to effect good will. We agree with everything the patient says, and, before we realize it, we are making a patient-designed bridge for an individual who has complete control over our operating procedure and is making it most difficult for us to proceed along the lines of our own knowledge. The final result is that we hear of and see ourselves as others see us.

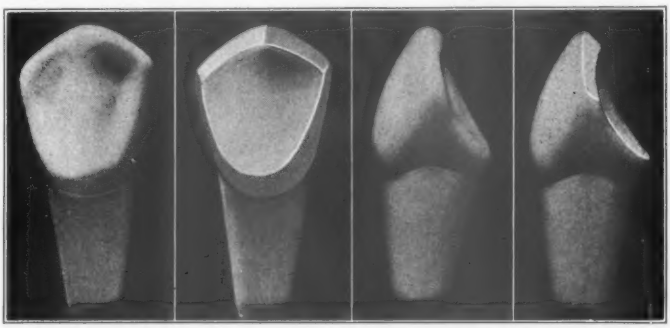

Fig. 2.—Preparation of enamel surfaces.

The patient does not find such conditions when he enters the physician's operating room, the hospital. Entering there, he tells everything that he knows of his family history and his past and present health conditions. The procedures from there on are on a strictly scientific basis,

not controlled in the slightest by the patient's limited knowledge.

Why should we not raise our standard procedure to a scientific basis and in a clean mouth proceed at once to make a full mouth roentgenographic survey including bitewing examination and pulp testing, following this with probes and illuminated mirror, charting the visible defects of the teeth and gingival, mucosal and alveolar disturbances, as well the contact points, degree of balanced occlusion and excursive ability of the jaws? When this is done, we should proceed at once with making impressions for study models in plaster.

Having the history, charts, roentgenograms and study models, we can correlate our findings regarding cavities, loss of contact points, the position of pulpless, infected or abscessed roots or traumatized teeth, the condition of the gingivae and resorption of the alveolar process and other bone conditions. We have study models showing the shape and location of every tooth and how and why it is in its present position with worn facets and aclusion. We now have a logical basis for a decision on the type of bridge or bridges which can be made to restore balanced occlusion. If there is a tooth missing anywhere in the mouth, the occlusion is not normal; and if it is not normal, it is not balanced. If, in this relation that tooth is not balanced with every other tooth, the tooth, as an abutment, will offer service to that abridged space and to the mouth inversely proportionate to the degree of trauma caused by the lack of balance. So, before any replacement is started, the affected teeth should be adjusted to a balanced occlusion and the replacement appliance be so designed and constructed as to submit to future balancing, when, through age, the condyle of the mandible permits a different excursive arc.

I am convinced that every type of bridge has its place and no one type will suffice for all cases. But where we have a sufficient number of posterior teeth to assure balanced occlusion, even with restorations, and there is need for replacement of from one to four anterior teeth, the fixed or stationary type will prove most satisfactory, and doubly so for the one-tooth replacement, provided the abutments are not solidly attached to each other through continuous soldered joints. They must be allowed, through movable attachments, to move in function.

Fig. 3.—Preparation of pin anchorages.

If the examination has been thorough, each one's judgment, experience and ability to interpret tissue reactions will decide for him the type of restoration that will prove most serviceable. If we decide on a fixed replacement, our decision involves either an all-porcelain or

a metal abutment. For descriptive purposes, we shall assume that we have chosen metal and have decided to follow the public's demand for economy, esthetic values and dependable service, and the dentist's demand for less tissue destruction, less reproduction of normal contact points and simplicity in construction, with fewer disappointments and less pain.

We have all these requisites in the simplest of cast direct pinlays and, with modifications of the simplest preparation, we have an abutment that can be depended on to meet all requirements. This abutment can be made very easily without showing gold labially by following a

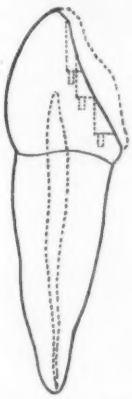

Fig. 4.—Diagrammatic sketch showing approximate relation of pin anchorages to the pulp.

few simple steps that I shall now describe, with the aid of slides and motion pictures, using the normal right cuspid as an example.

Figure 1 shows all the instruments necessary for preparation of the cavity except the handpiece, mirror and pliers.

CROWN PREPARATION

Step 1.—Figure 2 illustrates the normal tooth. After adjustment of the bite to balanced occlusion, the lingual incisal edge is beveled with a five-eighth or three-quarter inch mounted stone, in such a manner that no gold will reflect or show labially through the transparent enamel. Then enough of the lingual enamel is removed to clear the bite and give slight thickness to the gold.

Step 2.—With a flat five-eighths or three-quarters inch disk, placed at the incisal point angle of the crown of the tooth, the pontic side of the tooth is disked (Fig. 2), enough of the surface to the marginal ridge being removed to form a gingival ledge or butt and to give bulk to the pinlay. If an irregular butt or ledge develops, an end-cutting bur, or stone, is used to shape it at right angles or less to the long surface angle and pontic side cavity wall just formed. A slight bevel is cut on the opposite marginal ridge and lingual gingival border so that the pinlay will not interfere with the normal contact.

Fig. 5.—Waxing pins in the anchorage holes.

Step 3.—With a No. 29 or 30 Miller gage mounted stone, the lingual ledges are cut parallel to the pontic side cavity wall and long surface angle of the tooth. (Fig. 3.) The location of the incisal ledges is usually at the junction of the mamelons in the developmental grooves, the lingual in the lingual pit. In this parallel position, the stone is sunk to about one half its diameter. If necessary, the drilling position is shifted from one ledge to the

other to get all parallel to the cavity wall and long surface angle of the tooth. The dotted line indicates the usual position of the pulp.

Step 4.—After the ledges are formed, small clean-cut holes about 1 mm. deep, or one half the width of the stone, are cut with a No. ½ bur at a point in the ledge floor distally from the pulp, and not directly into the enamel covering. (Fig. 3.) When this is done, all rough surfaces are smoothed off with a fine cuttle-fish paper disk, and the cavity is prepared in not much more time than it takes to describe it.

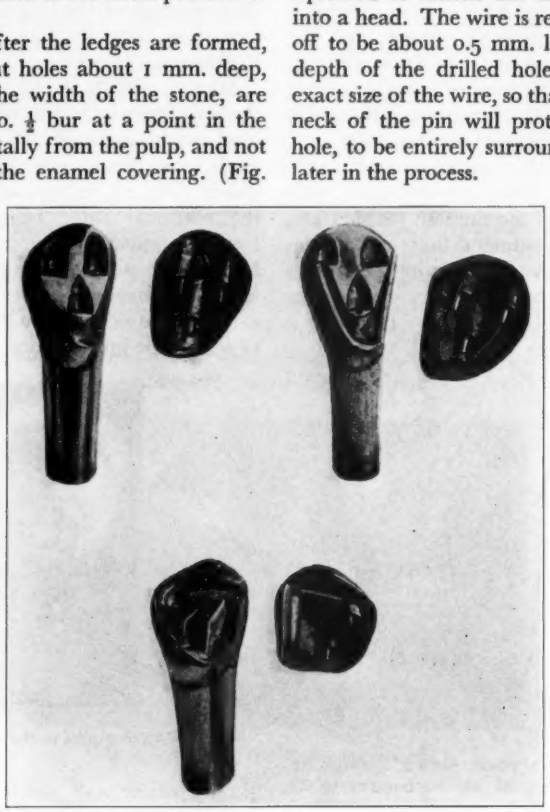

Fig. 6.—Modified pinlay preparations.

Figure 4 shows a lateral diagrammatic sketch of the approximate position of the pulp and pins. From this point on, we can use either the indirect or direct method of making the pinlay. I shall attempt to state in a few words how I proceed with the direct method.

A piece of 24-gage platino-iridium wire is inserted about one-sixteenth inch in the heel of No. 122 flat-nose pliers and squeezed to flatten the end of the wire into a head. The wire is removed and cut off to be about 0.5 mm. longer than the depth of the drilled hole, which is the exact size of the wire, so that the head and neck of the pin will protrude from the hole, to be entirely surrounded with gold later in the process.

DIRECT PATTERN PROCEDURE

We are now ready to proceed with the direct waxing. (Fig. 5.) A cotton roll is inserted over the labial gum and the excess moisture is removed from the cavity. A 50-50 mixture of castor oil and glycerin on cotton is applied to the cavity, care being observed not to leave any trace of oil in the cavity. The flat-headed pins can now be inserted in the holes in the cavity with college pliers. A ball burnisher or double end plastic instrument is

now heated and a little bit of melted wax is carried to the pin in the ledge. The wax will flow into the ledge and attach itself to the pin and hold it in its position.

If the pin is not parallel to the ledge and cavity wall, it can be seen through this bit of wax and, with a hot instrument, can be properly paralleled. In this manner, the pins are attached firmly in each ledge parallel to one another and to previously shaped celluloid, copper forms or rubber dam pulled tightly around the tooth. The wax is chilled and is now ready for carving.

THE CARVING

It is at the carving stage that I believe most of our failures in direct inlay work occur. It will be most instructive to ob-

Fig. 7.—Modified pinlay preparations.

the wall and long surface angle. The wax is heated in the usual manner and attached to a heavy piano wire probe. The wax is next glazed (or the surface wax melted) and, while in this melted state, it is carried to the dry waxed pins and carefully and accurately molded to all the cavity walls, with either the fingers, serve the carved direct patterns through a good magnifying glass. It will be found that wax is more of a liquid than is generally realized and that the molecular activity within itself has caused the wax to become spheroid and show marginal deficiency. Careless application and carving shows up in the casting as if the

gold had shrunk or contracted. The inlay goes into place, but leaves the marginal enamel rods incompletely covered. A few observations under the magnifying glass will convince one that close sculptural, anatomic carving is beyond the ability of the average practitioner. So, in carving the wax, it is well to be sure that the enamel margins are covered as you would like to have the gold cover them. It is always practical to add a slight excess to the vulnerable spots, such as the buccal-gingival angle. This should not be carved to a delicate feather edge unless one is a specialist in casting. Our casting procedures make feather edges possible, but for ease in burnishing to the cavity margins, it is much better to leave these margins thickened than to tax our casting ability with the presence of a delicate film of molecularly active wax.

This procedure should not suggest bulky and slovenly carved patterns, but patterns which are accurately carved with butted margins and which, when cast, can be still further burnished without grinding off the enamel to make the cavity margin fit the pinlay.

REMOVING THE PATTERN

The fact that we have a definite parallel procedure for preparing the cavity affords a more definite direction from which to withdraw the pattern. A heated heavy piano wire probe is inserted between the incisal ledges, with the fingers braced on the adjoining teeth, and is held steady until cooled. The wire is withdrawn parallel to the cavity walls and long surface angle, and the wax carefully watched to see that it does not stretch anywhere. If the wax can be removed smoothly, it is detached from the probe and placed in room temperature water until invested.

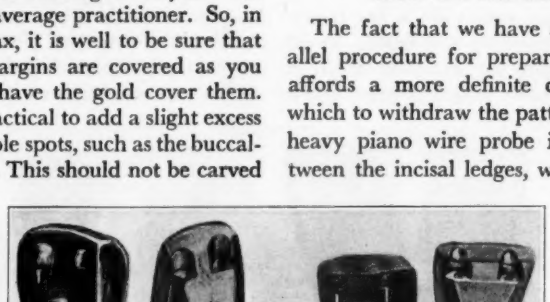

Fig. 8.—Modified pinlay preparations.

Should we find a pin missing, not paralleled, or a wall undercut, it will not be

necessary to remake the whole pattern. If the fault is a wall undercut, the undercut in the cavity is ground away, and the pattern replaced and covered tightly with rubber dam. The rubber over the recut area is touched with a heated burnisher to soften the wax, and the carving checked and withdrawn. If the fault is a loose or misalined pin, the offender is removed, the pattern reinserted and the wax carved away from the offending ledge. A lighted mirror is placed over the tooth and one under the tooth in order to see the pin hole. The pin is then reinserted and held by warm college pliers, parallel to the long surface angle. It will then be parallel to the others. The area is rewaxed and the pattern is tightened to the walls and margins again, the carving checked and the pattern carefully removed. It is very essential to remember that the wax is thin and must be considered semiliquid, so that no outside conditions of temperature will be permitted to affect it before it is in the hardened investment. The investment and casting need not be described in detail, but I should like to mention a few observations from experience in handling all kinds of investments and casting machines for twenty years.

If we start with a well-planned cavity, and have an accurately carved, thick-margined wax pattern, held to a crucible from its thickest section by a 16 or 17 gage sprue, bearing a "shrink spot" reservoir close to the pattern, and follow the investment manufacturer's directions closely, using the casting machine suggested for his material, any standard type of investment and any casting machine will faithfully reproduce the pattern in almost any kind of noble metal. When cast, the pinlay should be allowed to cool slowly. It should then be removed from the investment, cleaned and pickled to remove any oxide, cleaned again and tried in the cavity. If we have followed our known technics carefully, we shall have a pinlay that can be easily burnished and carved with burs and stones to hermetically seal the cavity, and be strong enough to meet any abutment requirement.

One should always operate in a clear, clean visible field with true running handpieces and new burs and stones. Each step should be well-planned with care as to details of cavity preparation and parallelism. Wax should be inserted in the cavity and the pattern removed carefully, with the investment properly heated and carbonized and the gold new and clean. If these fundamentals are carried out with every operation, there will be little reason for making dental service difficult to ourselves, and the results unsightly, expensive and unsatisfactory to our patients.

The modifications of cavity preparation shown in Figures 6, 7 and 8 can be used in any anterior tooth, upper or lower, and will afford some idea as to how the pinlay can be strengthened without involving an interproximal contact to give additional strength for the close, worn or extra heavy bite. These figures illustrate pinlays on central and lateral incisors where, by planning the procedure of paralleling the cavity walls to the long surface angle of the crown of the tooth, we can eliminate all appearance of labial gold.

BACTERIOLOGIC EXAMINATION OF PULPLESS TEETH BEFORE FILLING ROOT CANALS

By Louis I. Grossman, D.D.S., Dr. med. dent., Philadelphia, Pa.

BACTERIOLOGIC examination of the root canal to determine sterility of a pulpless tooth before filling its canal was probably first suggested by Coolidge[1] as a routine procedure.

The *raison d'être* for a bacteriologic examination is ably discussed by Appleton,[2, 3] who points out: 1. If the function of root-canal therapy is to render the canal and periapical tissues sterile, the only method which can determine whether that objective has been attained is a bacteriologic examination. 2. Since the micro-organisms present in chronic periapical infections do not always cause a putrid odor, the futility of smelling the canal dressing to determine sterility is obvious. 3. On the basis of statistical data, the findings of bacteriologic examinations *do* reflect the bacteriologic condition of the root canal or of the periapical tissues.

In an effort to determine how often the bacteriologic status coincides with the clinical appearance, Grossman[4] enlisted the aid of several dentists, who took cultures when they believed that the root canal was ready for filling to judge by the appearance and the odor of the dressing. Of 150 teeth cultured just prior to filling, 58 per cent were found sterile. In the 42 per cent, bacteria were still present, and had the dentists filled the teeth at that time, the entire purpose of root-canal therapy would have been defeated. From this study, it may be concluded, with some reservation, that when a bacteriologic examination is not made before the root canal is filled, the chances are four out of ten that bacteria are still present.

The question concerning the value of a negative culture has often been raised. It has been conceded that a positive culture is conclusive evidence that the root canal should not be filled, but it has been questioned whether a negative culture gives a true picture of the condition. At present, although a negative culture is not always conclusive evidence that the infection has been eliminated, it is the best known indication that the tooth is ready for filling.

The bacteriologic examination shares with other laboratory tests—Wassermann, Schick, tuberculin, etc.—the quality of fallibility. Although it is not infallible, it is of definite value in that it tells when not to fill a canal. Thus, it is an important health tool in the hands of the clinician.

MAKING THE SMEAR

The two methods for determining the bacteriologic status of a pulpless tooth are (1) the smear and (2) the culture. Although the latter is more commonly employed and is probably more sensitive, the former also serves a useful purpose. The condition of the root canal or of the periapical tissues can be determined in a few minutes while the patient is still in the chair, without loss of time either to the patient or to the operator. Because the smear method is not so sensitive as the cultural method, it is often used as a guide to indicate whether the canal is ready for culturing.

The method for making a smear is as follows: If, in the judgment of the operator, a sufficient number of treatments

have already been given, a glass slide is prepared for making the smear. The slide is washed thoroughly with soap and water, then with alcohol. The excess alcohol is burned off and the slide placed on the operating tray. The temporary filling is removed and discarded. Now the dressing is removed from the root canal, and, if it appears to be unstained, it is placed upon the prepared microscope slide. The dressing is held with cotton tweezers and smeared across the glass slide so as to leave a thin, even deposit, and is allowed to dry in the air. This may take from a few seconds to a minute. The bacteria are fixed on the slide by being passed over a Bunsen or alcohol flame three or four times, the smear side uppermost. The under side of the slide, when placed against the back of the hand, should feel tolerably but not uncomfortably hot. The smear is now stained with methylene blue for five minutes, with gentian violet for two minutes or with carbol fuchsin for one-half minute. After a period of from one-half minute to five minutes, depending on the thickness of the film and stain used, the excess stain is washed off by holding the slide under running tap water. The slide is now dried by compressed air sprayed over the surface, or is blotted dry with an ordinary paper blotter: blotted, but not rubbed dry. The slide is placed upon the stage of the microscope and a drop of cedar oil added, and examination is made with the oil immersion lens.

Findings.—If bacteria are present, they will be seen as small coccal forms, either singly or grouped in chains, sometimes in clusters. Rod forms may, at times, also be seen. These findings indicate that sterility has not yet been attained and that treatment should be continued.

If many pus cells (leukocytes) are seen, either with or without bacteria, it is an indication that infection is still present and treatment should be continued. An occasional pus cell is not significant.

In the absence of bacteria or a large number of pus cells, the root canal may be considered potentially sterile and ready for check-up with a culture.

TAKING THE CULTURE

Microscopic examination of a smear may be dispensed with in the event the operator has no facilities for it and a culture be taken at such time as the number of treatments and the appearance of the dressing warrant it. The technic is as follows: The dressing from the canal which would ordinarily be used for making a smear is discarded. A fresh, sterile absorbent point is inserted in the canal to cleanse the canal's surface of any traces of medicament. This absorbent point is discarded and a fresh sterile absorbent point inserted to the apex of the tooth and allowed to remain there for a minute. It is then removed and, if its tip is moist, is dropped into a tube of culture medium. If the absorbent point comes out dry, a drop or two of culture medium is carried into the canal, with precautions for sterility, to supply the needed moisture.

Hormone broth, Rosenow's glucose-brain broth, Rosenow's liver broth or Holman's broth is a satisfactory culture medium. In preparing the culture tube for reception of the absorbent point, the cotton plug is removed with a rotary motion and the lip of the tube flamed. The tube itself is held at an angle of about 45 degrees to prevent contamination from air. When the absorbent point has been dropped into the culture medium, the cotton plug is replaced.

At times, the absorbent point adheres to the wall of the culture tube without dropping down into the medium. In such cases, tapping the side of the tube with the finger, carefully but sharply, will send the point into the liquid medium; or an effort should be made to float the absorbent point by slowly tilting the tube so that when the culture medium comes in contact with the point, righting the

tube suddenly will carry it down with the liquid medium. If this fails, the cotton pliers should be sterilized by flaming with alcohol three or four times, then inserted into the tube to push or carry the point down into the medium. The culture tube, properly labeled, should then be incubated for at least forty-eight hours.

If a thermostatically controlled incubator is not available, a thermos bottle may be substituted. A full description of the method is given by Appleton,[5] but some of the essential details will be related here. A quart size thermos bottle of a reliable make is used. A mercury thermometer is placed through the center of the cork stopper and sealed securely.

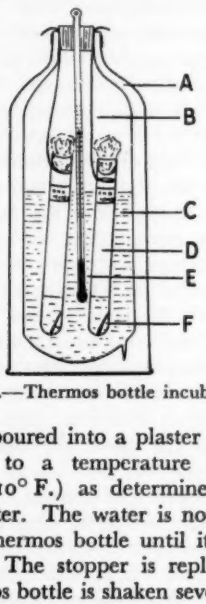

Fig. 1.—Thermos bottle incubator.

Water is poured into a plaster bowl and regulated to a temperature of about 43° C. (110° F.) as determined by the thermometer. The water is now poured into the thermos bottle until it is about half full. The stopper is replaced and the thermos bottle is shaken several times so that the inner surface of the container will take up the warmth of the water. When the thermometer reads 38° C. (100° F.), this improvised incubator is ready to receive the culture tubes. Each tube is suspended in the water by a piece of dental floss securely tied around its top. The end of the floss is left hanging out of the mouth of the thermos bottle and is held securely in place when the cork stopper is replaced in the bottle. The tubes should not be immersed so deeply that there is danger of wetting the cotton plugs. (See Fig. 1.)

After forty-eight hours, during which time the temperature of the incubator has dropped a few degrees, but not sufficiently to affect the growth of microorganisms, the culture tube is pulled out by means of the dental floss and is examined for sterility. If the culture is sterile, no visible change in the appearance of the medium will have occurred. This should be checked by holding it alongside a tube of unused, sterile culture medium. Any turbidity of the medium, however slight, is indicative of growth of bacteria. In case of doubt, a loopful of culture medium is transferred to a clean glass slide and a smear is made. The presence of bacteria in the smear indicates a positive culture.

Culture medium may be obtained from a local hospital or clinical laboratory or a dental school. It is also available commercially in sterile, screw-capped glass tubes, which may be kept for several months without deterioration.

If either smear or culture shows the presence of bacteria, treatment should be continued until a negative smear or culture is obtained; or the advisability of further treatment should be reconsidered. Generally speaking, three successive positive cultures should condemn the tooth as a poor risk, in which further root-canal treatment would be unwarranted.

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HISTOLOGIC EVIDENCE OF THE BENEFITS OF TEMPORARY FILLINGS AND THE SUCCESSFUL PULP CAPPING OF DECIDUOUS TEETH*

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MOST technics used in the practice of dentistry have been evolved on the basis of clinical experience of past and present operators. In other words, most of the methods used in restoring the teeth to function have been developed by the trial and error method. Those operations and reconstructions which made the patient comfortable and restored the masticating power of the teeth were retained in use, and those which proved failures were discarded. This is an oft-repeated thought, but it is emphasized here in order to show the need of placing our operative procedures on a more scientific basis. A step in this direction would be to increase our knowledge concerning the effects of our dental reconstructions on the pulps. To this end, we must acquaint ourselves better with histology.

Formerly, a knowledge of the minute structure of the teeth was not considered essential to the practice of dentistry. Up to a few years ago, the teeth were not believed to react to the insertion of fillings except possibly by the formation of secondary dentin. Now, more and more, the conception is growing that the teeth are vital organs in which reactions occur. Not only do they react to the placing of fillings, to caries and to erosion, but also evidence has been presented that their structure and physical character change from youth to old age.

The linking of our clinical work with the biologic reactions of the teeth is a fascinating and engrossing subject, knowledge of which will do much to improve our operative procedure. With the knowledge gained from such a correlation, we shall be able to interpret symptoms more exactly. Also, we shall be able to vary our technic to fit the individual case, and to select the proper filling material. We shall be able to visualize the changes taking place in the interior of the teeth and know why one type of filling is better for their welfare than another. The subject to be considered in this paper is the reaction of the pulp and dentin to our operative procedures. Such knowledge will enable the young practitioner to place fillings with the least possible pain and with no subsequent discomfort. Saving the patient unnecessary pain is an effective practice builder.

With the conviction that the majority of the audience are interested primarily in clinical work, it is the intention to select two conditions encountered in daily practice and link these with the histologic reactions noted in the teeth. Comprehension of these reactions will disclose how greatly each type of operation has affected the welfare of the tooth and will enable us to evaluate the chances of success of the treatments. We shall consider particu-

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larly (1) extensive restoration of children's teeth, and (2) pulp capping of deciduous teeth as recently described by Stowe.

EXTENSIVE RESTORATION OF PERMANENT TEETH OF CHILDREN

The proper time for making extensive permanent restorations depends on the age of the patient and the type of the tooth requiring filling; in other words, on how long the tooth to be treated has been in the mouth. In the past, many investigators considered the crowns of newly erupted teeth complete in every detail. Now we know that this is not altogether true. Certainly, the crown is anatomically complete and no change can occur in its form. On the other hand, its hardness continues to increase for some years after its appearance in the mouth. Evidence of this was presented by Pickerill.[1] Beust[2] applied the comprehensive term of "maturing" to the process. He showed that matured teeth take stains less readily than young, newly erupted ones, and he called the mature and the young chromophobic and chromophilic, respectively. Hodge,[3]

Fig. 1.—First upper molar in which large filling was placed at age of 8 years. Irritation of the pulp, which resulted in extensive formation of secondary dentin (SD), apparently persisted, resulting in resorption (R) of both secondary and primary dentin (PD). Finally, the death of the pulp caused the loss of the tooth. P, pulp chamber. CCC, cavities which contained fillings previous to preparation of the section.

Karlström[4] and others showed, by means of various types of hardness testers, that an increase in hardness occurs after the eruption of the teeth. This is believed to be due to an increase in calcific salts.

The fact that the hardness of newly erupted and mature teeth varies is of some clinical importance as this condition must be considered in protecting cavity margins from undue stress. But this factor is unimportant in comparison to another, which is of more interest to operator and patient alike; i.e., the difference in permeability of mature and of newly erupted teeth.

Fig. 2.—Formation of secondary dentin (SD) as result of mild irritation. PD, primary dentin. P, pulp. O, odontoblasts.

The following suggestions are based on the correlation of clinical experience and histologic observations. Let us take a concrete case in order to clarify this correlation. Suppose a child of 7 or 8 years presents an extensive occlusal cavity, without pulp involvement, in a first permanent molar, either upper or lower. Clinical experience has shown us that these teeth are often highly sensitive to instrumentation, and laboratory observations indicate that the dentin of such teeth is highly permeable. Should the operator excavate and prepare the cavity completely for a permanent filling? Should he use procaine anesthesia or an obtundent to allay the pain of this operation? An immediate completion of the permanent filling is probably necessary in the majority of cases in which the dentist is working to obtain a proper balance between the high cost of living and comparatively low fees. But histologic examination of teeth in which deep-seated cavities were immediately prepared for permanent fillings while the patient was young show that a severe reaction of the pulp can occur under such conditions, resulting in the extensive formation of irregular secondary dentin.

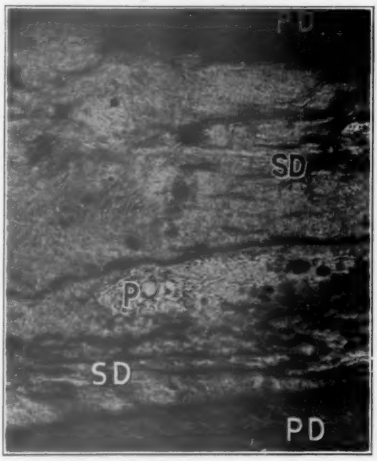

Fig. 3.—Root canal almost obliterated by irregular secondary dentin (SD). PD, primary dentin. P, remnant of pulp.

Figure 1 shows a photomicrograph of a section of an upper first permanent molar in which a large amalgam filling was placed soon after its eruption. After that, it carried gold foil fillings and then a mesioclusodistal inlay. In all, it had been filled for over forty years. The reaction of the pulp to these procedures is striking. At first, there was resorption of the pulp chamber, which was afterward filled in by

a bonelike cementum. It is evident that conditions had not become normal, even at the time of the removal of the tooth, as internal resorption of the primary dentin still was active.

I shall not say at the present time that the hasty laying down of irregular secondary dentin is directly harmful, but, from a biologic point of view, it seems that the slow, physiologic formation of secondary dentin, i.e., its unhurried growth, ing the development of the tooth. Slowly formed secondary dentin is usually somewhat more dense and has fewer and often more irregular tubules than has primary dentin. Hastily laid down secondary dentin, resulting from a severe irritation, may be more permeable, as it frequently contains pulp rests composed of cells, and even blood vessels which have been engulfed in the calcified mass. Figure 3 shows a pulp canal which has been filled almost

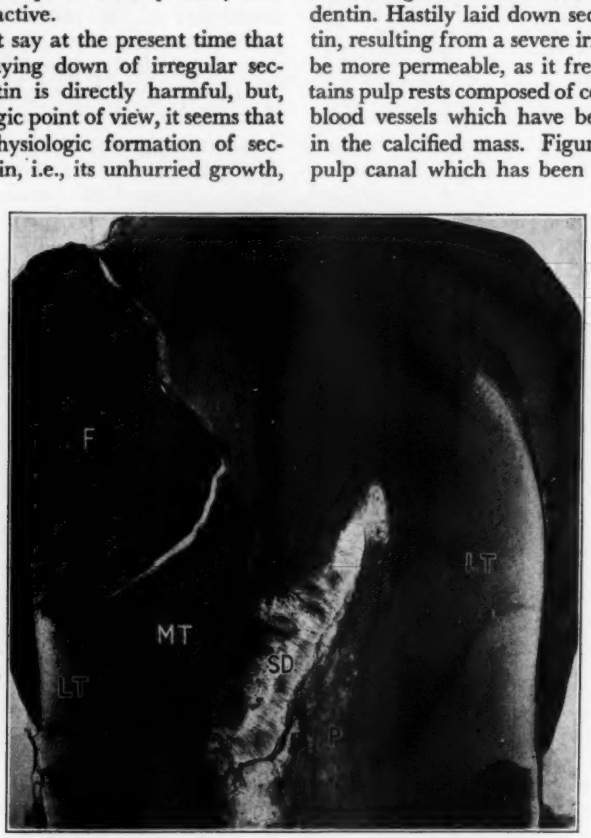

Fig. 4.—Incisor with silicate filling (F) irritating pulp (P) so that one pulp horn is completely filled with irregular secondary dentin (SD). Dentinal tubules leading from filling to pulp are completely matured (MT) and lymph filled tubules are noted at LT. P, pulp passing into remaining horn of pulp chamber.

would appear to be a more normal process. The structure of the two types of secondary dentin laid down as a result of a severe and of a mild irritation varies considerably. That which is laid down as a result of a mild irritation (Fig. 2, SD) approaches more nearly the structure of primary dentin (PD); i.e., that which is formed dur- completely with secondary dentin of this type (SD), only a minute channel for pulp tissue (P) remaining.

What is the alternative technic that will prevent the abnormal condition described above? The operator, instead of proceeding with the immediate and complete preparation of the cavity, can select

another procedure: he can excavate the cavity carefully by removing only the leathery, decalcified dentin (soft decay) and place a temporary filling of oxyphosphate cement. Should the cavity be near the pulp, the use of zinc oxide and eugenol is indicated. Teeth which have had no previous filling are often too sensitive for completion of the excavation of the cavity at one sitting; in which case, a dressing of pink baseplate gutta-percha with camphorated validol is beneficial.

A brief description of this technic may be in place, as the use of this drug is unknown in this connection. The procedure is as follows: Pink baseplate gutta-percha is cut into 3 to 6 mm. pieces and

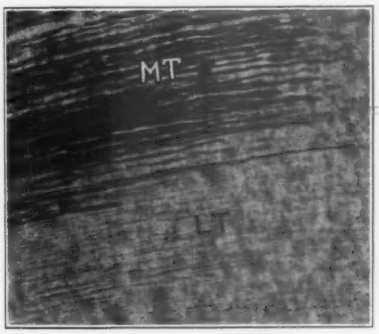

Fig. 5.—Permeable dentin containing lymph-filled tubules (LT) and impermeable dentin in which tubules contain gas. These are matured (MT).

heated to the necessary plasticity. A number of these pieces, sufficient to fill the cavity, are taken up on a ball burnisher, dipped into camphorated validol and pressed into the cavity. Needless to say, there must be no pulp exposure; otherwise, the pressure of the gutta-percha will cause pulpitis.

Validol camphorata has two valuable properties when used in connection with gutta-percha. It appears to have a sedative effect of long standing on the dentin, and it dissolves the gutta-percha slightly, thus sealing the dentinal tubules. Validol also makes a smooth working mass of the gutta-percha, so that it is easily manipulated. Finally, the dipping of the hot gutta-percha in the validol cools it to such an extent that the patient barely senses any discomfort even though the cavity is sensitive.

Not only are temporary fillings of pink baseplate gutta-percha and camphorated validol or zinc oxide and eugenol useful in the teeth of children, young adult patients with particularly sensitive teeth will be grateful for similar careful treatment.

Such a temporary filling is left in the tooth for one or two weeks, after which time both operator and patient will be surprised at the greatly reduced sensitivity of the dentin. The complete preparation of the cavity for the permanent

Fig. 6.—High magnification of lymph-filled tubule (LT) and gas-filled one (MT).

filling can then be accomplished. The longer such a temporary filling is allowed to remain in place, the less will be the pain during a subsequent preparation of the cavity. However, it cannot be left for a long time, if masses of infected dentin remain in the cavity or if the gutta-percha is located between the teeth and subject to the stress of mastication. In the latter case, it may tend to separate the teeth unduly, press down the gum tissue and loosen the gingival attachment.

I know that the above described technic seems to be a complicated procedure as preliminary to the placing of a permanent filling and that it cannot be used as a routine by all dentists. Nevertheless, there

are many patients having highly sensitive teeth who will gladly reimburse the operator for such careful treatment. The expenditure of the extra time for placing such temporary fillings is little, because these may be inserted in less time than it has taken to describe the procedure. The best way to determine its value is to use it on the teeth of one's own family, who will appreciate the difference if they have previously had complete cavity preparation for permanent fillings without anesthesia or an obtundent.

So much for the technic of treating sensitive teeth of young persons. Now let us turn to a discussion of the reason why this procedure is advocated, particularly in immature permanent teeth. The reduction of pain during the excavation of a cavity is of direct benefit to both patient and operator; but this is not its principal advantage. Its greatest benefit lies in the fact that the pulp does not receive such a severe shock as results from preparing completely a virgin cavity. If a temporary filling has been placed, the pulp has had an opportunity to build a protective wall of secondary dentin slowly, as a result of the milder irritation of the temporary filling.

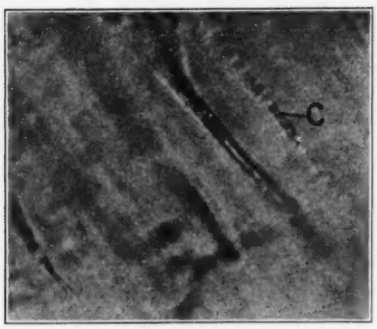

Fig. 7.—Dentinal tubules filled with dried remnants of lymph, probably calcific matter (C).

The histology of the dentin must be reviewed briefly in order to comprehend the manner in which a temporary filling reduces pulpal irritation. Infinitesimally small channels (two twenty-five thousandths inch in diameter) run from the pulp to the surface of the dentin. These, the dentinal tubules (Fig. 4, LT), contain processes of cells, the odontoblasts, of the dental pulp. A fluid, the dental lymph, has now been shown[5, 6] to diffuse through these channels, passing in two directions; i.e., centrifugally and centripetally. This fluid diffuses most freely in young teeth. Consequently, when dental caries attacks such young teeth, the destructive process penetrates rapidly and deeply, owing to the high permeability of the dentin. Thus, the pulp is in an irritable condition before the dentist starts treatment of such teeth. If the cavity is excavated completely at one sitting, the sensitive pulp shows this added irritation keenly by the hasty laying down of irregular secondary dentin. (Figs. 3-4.) If, on the other hand, a temporary filling is inserted previous to complete excavation of the cavity, the dentin between it and the pulp loses much of its permeability. The fluid previously present in the tubules decomposes, forming a gas and a dried remnant of dental lymph. (Fig. 5, MT.) Thus, the tubules are clogged and the permeability of this

Fig. 8.—Decomposition of dental lymph in extremely small lateral branches (LB) of tubules, making them visible.

area as well as the severity of the irritation of the final filling is reduced. The histologic difference between permeable and mature dentin is shown in Figures 5-7 under high magnification.

The foregoing discussion applies to all newly erupted teeth, both deciduous and permanent. Those of the permanent dentition mature slowly and remain highly permeable ten or fifteen years after their eruption. The deciduous teeth, on the other hand, appear to mature more rapidly. Their crowns seem to pass through their cycle of development quickly and reach complete maturity at the age of from 8 to 10 years. This may be one of the reasons that the deciduous teeth are not so sensitive to the dental drill as those of the permanent dentition. The pulps of the deciduous and permanent teeth vary in degree of painful reaction to operative procedures, yet no histologic differences have been noted to account for such a clinical observation.

The first permanent molars are recognized generally to be the most important teeth in the mouth because their loss results in a severe derangement of the occlusion. These teeth, therefore, may well be treated with the greatest care by the use of temporary fillings in cavities which approach the pulp.

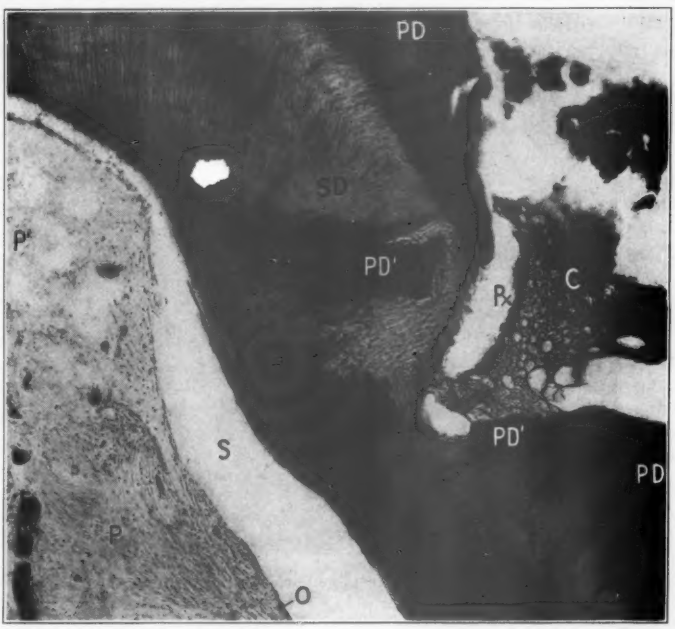

Fig. 9.—Deciduous tooth with an operative pulp exposure, retained in clinically normal condition for over two years by pulp capping. Shavings of primary dentin (PD') were forced into the pulp tissue during the excavation of the cavity. These were afterwards completely surrounded by secondary dentin (SD). C, location of pulp cap over pulp exposure (Px). P, normal pulp. P', pulp normal, though out of focus. O, odontoblasts. S, space caused by pulp tissue being drawn away from secondary dentin during preparation of section.

CAPPING OF PULPS OF DECIDUOUS TEETH

Professor McBeath points out that pulp

exposures in deciduous molars are relatively common, owing to the proximity of the pulpal horns to the dentino-enamel junction.

Root-canal therapy for children is a difficult procedure for many dentists. The premature removal of the offending tooth leads also to complications. Unless a space retainer is placed, the arch becomes constricted, and thus subsequent orthodontic treatment becomes necessary. It is clear, therefore, that root-canal therapy, as well as the removal of deciduous teeth, results in complications for the dentist and the child alike. The alternative form of treatment of pulp exposure in deciduous teeth is pulp capping.

Stowe uses a method previously advocated for filling deep, incompletely excavated cavities in permanent teeth. He has reported, in a recent paper presented before the Dental Society of the State of New York, appróximately 85 per cent successes in capping pulps of deciduous teeth in 250 cases. This report is based only on cases which returned to the clinic for checking. Doubtless, more patients were comfortable and hence did not return.

The technic involves the use of silver nitrate in combination with various dental cements. Silver nitrate crystals are added to the cement fluid and allowed to remain twenty-four hours. The fluid is decanted carefully or filtered and is then ready for use. In order to retard the precipitation of the silver nitrate in the stock solution, caused by the effects of light, it is advisable to keep the fluid in a brown bottle or in a dark place. Applying a coat of paint to the bottle or wrapping it in a black paper are other convenient ways of excluding light from the fluid.

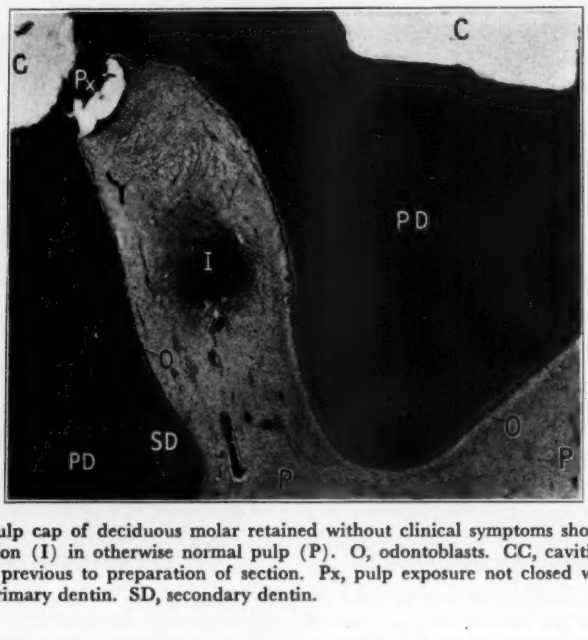

Fig. 10.—Pulp cap of deciduous molar retained without clinical symptoms showing localized area of infection (I) in otherwise normal pulp (P). O, odontoblasts. CC, cavities which contained fillings previous to preparation of section. Px, pulp exposure not closed with secondary dentin. PD, primary dentin. SD, secondary dentin.

The cement powder and silver nitrate liquid are mixed to the usual consistency for setting inlays, and in this state is "teased" over the area of exposure, after an application of phenol. When the

cement thickens, the rest of the cavity is filled, the use of pressure being avoided.

Stowe has used a number of cements, but he has had the best results from those of the harder type, such as zinc-oxyphosphate and red copper cement. The advantage of these over the softer types, such as zinc oxide and eugenol, is that when once the pulp cap is placed, it need not again be disturbed. Also, it forms a suitable base for an amalgam filling. Further reports will be made by Stowe and Rosenstein,[7] giving the results with various types of cements.

The decision as to whether in each case treated by this method, pulp capping was a success or a failure was not based entirely upon clinical symptoms, which were favorable in 85 per cent of the cases. The children felt no discomfort and could masticate with the treated teeth with ease. But the absence of symptoms does not always indicate that normal conditions prevail, as shown by past experience with extensive apical infection around permanent teeth. Hence, some cases were examined histologically in order to obtain exact details of the state of each pulp.

In many cases, pulp exposure treated in this manner had resulted from the encroachment of dental caries. In some of these cases, healing followed the use of this pulp capping method. The infection was eradicated completely in some cases; in others, a larger or smaller localized area of round-cell infection persisted. It is proper to emphasize at this time that even in those cases in which infection remained, no clinical symptoms occurred; the patients were comfortable, and the teeth were used in mastication up to the time of exfoliation.

Two photomicrographs of Stowe's cases are reproduced to show the manner in which exposed areas were healed after being treated in the above described manner. (Fig. 9.) The pulp of the molar was exposed (Px) while the student was excavating the cavity (C). The photomicrograph of the section shows the condition of the tooth two years and one month after the pulp cap was placed. Thick layers of secondary dentin (SD) cover the exposed area and the pulp (P) has become completely normal. There is no sign of infection or hyperemia. Objection may be raised that the secondary dentin noted in the specimen might have been formed previous to placing of the pulp cap. Stowe has, however, in this case, definite evidence that it was formed after the operation. That the bur must have penetrated the pulp tissue at the time of the exposure is shown by the presence of three minute shavings of primary dentin (PD^1) embedded in the secondary dentin. This proves that the secondary dentin was formed after the operative exposure was made, and, further, that the pulp has overcome the effects of injury as well as the infection.

The pulps of deciduous teeth seem to have greater recuperative power than those of the permanent teeth. The reason for this difference is unknown. Stowe points out a possible explanation of this higher recuperative power by emphasizing the fact that, in the cases treated, resorption of the roots of deciduous teeth had already started when pulp exposure occurred and treatment was instituted. The opening of the root apices by the resorption process would permit a greater flow of blood, and, hence, a more favorable condition for eradicating infection. Permanent teeth, on the other hand, have only minute openings in their root apices for the entrance of blood vessels, nerves and lymphatics. Hence, the blood supply in permanent teeth cannot be increased greatly when pulp exposure and infection occur.

One further point must be considered, and that is the possibility of focal infection originating from capped pulps. In the few cases in which the pulps were exposed during excavation of the cavity, recovery was complete, the opening being

closed with secondary dentin and the pulps showing no signs of infection. Such cases, therefore, have a very favorable prognosis. On the other hand, the capping of deciduous pulps having exposed carious areas does not always lead to closing of the original opening (Fig. 10, Px), although secondary dentin (SD) may form in other parts of the pulp chamber. Also, definitely localized areas of infection (I) of varying size in otherwise normal pulps were noted in the histologic sections. The question which must be considered is: Can such slightly infected pulps be harmful to the child? Further work is being done by McBeath, Stowe and Rosenstein in the attempt to determine the answer. One mitigating condition, indicating that little if any harm can be done to the child, is that the tooth is retained for but a comparatively short time. Further, if we compare the extensive infection present in many tonsils of children and adults, or, a still more common condition, gingivitis, to the degree of infection defined in the capped pulps of deciduous teeth, examined in this investigation, it seems that this technic can be employed wherever slightly infected, highly vital pulps are encountered.

CONCLUSION

The use of temporary fillings in the treatment of virgin cavities of recently erupted teeth presents one disadvantage; i.e., one or two extra sittings of brief duration are necessary. Balanced against this are two distinct advantages: (1) the patient, although anesthesia is absent, experiences little pain, and (2), an even greater advantage, the pulp is not subjected to such severe irritation and hence remains in a more nearly normal condition.

Stowe and Rosenstein presented evidence that pulp capping of deciduous teeth is successful in a large percentage of cases. Operative pulp exposure in a dry field can be treated without misgivings, for these areas have been observed to heal normally. Stowe finds that the less deeply the infection has penetrated the pulpal tissue, the greater the possibility of complete recovery; i.e., closing of the exposed area with secondary dentin and the complete eradication of infection, the deciduous teeth thus being retained in normal function until the time of replacement by their permanent successors.

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DISCUSSION

Anderson M. Scruggs, Atlanta, Ga.: —Although it may not have been his specific intent, Dr. Bodecker deals with two general phases of dental practice the neglect of which has done more than anything else to keep dentistry in the background of public opinion; namely, the elimination of pain in dental operations and an awareness of the dental pulp as a vitally important component tissue of the tooth. To the observations on the influence of pulp-capping and temporary filling on the pulp, I have nothing further

to add, but I shall comment on the two points above mentioned.

Dr. Bodecker, in discussing the benefits of temporary filling and pulp-capping, mentions the elimination of pain in dental practice, and his presentation of the changes that take place in the dentin and the pulp as a result of painful, extensive and hurried operations is very timely, since the public is gradually becoming aware that pain in dental operations is not actually necessary. There is a need, not only for continued histologic research on the pulp after various dental operations, but also for such expositions as Dr. Bodecker has given us. The value of any kind of research is not fully manifest until it has become an integral part of the professional equipment of the general practitioner.

Before taking up the study of dentistry, I often wondered why dentists should go on, day after day, preparing teeth for filling in the same old painful way. It seemed that dental pain was the heritage of man and that the dentist was loath to deprive his patients of this discomfort. Now that I know at least a little more regarding dentistry, that boyhood wonder has not abated; in fact, it has increased. Patients usually do not stay away from the dentist because they are financially handicapped or grossly indifferent to the condition of their mouths, although it is admitted that these may sometimes be deterrents. It is fear that keeps them away. Even the strongest and most self-willed man will usually shrink from the dental bur. And why shouldn't he? Is there anything more annoying than the whirling of a piece of alien steel against such an intimate part of the human body as a molar tooth, which heretofore has remained quietly in the seclusion of the oral cavity? The grinding of a tooth has a psychologic as well as a physical significance to the patient, and if there ever were reason for the elimination of pain, it is evident during the dental operation, which the patient knows must be repeated at more or less regular intervals. If all dentists were to make an effort to eradicate pain, the patronage of dental offices would increase at least 50 per cent. Dr. Bodecker shows not only that pain in the preparation of cavities has scant justification, but also that the immediate filling of deep and sensitive cavities may result in a severe pulpal reaction.

In outlining his operative treatment for such cavities, Dr. Bodecker, being a histologist, bases his procedures, of course, upon histologic phenomena within the pulp cavity; i.e., the laying down of secondary dentin around the pulp and the degree of permeability of the dentin; pointing out that a slow, physiologic deposit of secondary dentin is the thing to be desired, rather than a hurried deposition. He uses the character of the secondary dentin and the cellular contents of the pulp as a gage to determine whether the dentist has proceeded with adequate care in cavity preparation and treatment of the pulp. This, in his own words, is "placing operative procedures upon a more scientific basis." It is fitting that this should be called to the attention of dental practitioners everywhere since it is apparent that one of the greatest deficiencies of dental practice is the disregard of the pulp tissue. Too many dentists think of the health of the pulp only when some patent physical sign or symptom such as toothache, swelling or soreness or other form of discomfort becomes evident. A great deal of fine investigation is being made on the dental pulp by histologists, and their work is in libraries and periodicals for all to read who will; but, for some reason, the general practitioner does not give that tissue the attention it deserves. The pulp is a highly vascular, embryonal type of connective tissue, and, by reason of its vascularity, particularly susceptible to inflammatory changes. It is a truism that serious secondary infections may often result from

infections within the pulp; yet it seems that most dentists adopt a negative attitude toward the pulp until it shows some grossly apparent sign of disturbance.

After presenting a method for the temporary filling of young, vital teeth, Dr. Bodecker says: "I know that the above-described technic seems to be a complicated procedure, preliminary to the placing of a permanent filling, and that it cannot be used as a routine by all dentists." This statement calls to mind another professional attitude that, in my opinion, needs correction. Patients are able to understand and appreciate tangible operations such as the placing of an inlay or an amalgam; but few are really aware of the great service a dentist is rendering when he takes the proper care of an already highly irritated pulp. Dentists should never lose the opportunity of informing patients of the importance of such service, and they should not fail to charge for it. The dentist's reluctance to charge for treatment as he does for his more obvious dental operations accounts largely for the purely mechanistic atmosphere of so many dental offices. Intelligent patients will gladly pay for those subtleties of dental practice which differentiate the *dentist* and the *dental mechanic*.

There would seem to be no logical reason that a deciduous tooth pulp should not respond to capping as readily as a permanent tooth pulp, and it is difficult to see why so many dentists harbor the idea that it does not. As Dr. Bodecker says, "The pulps of the deciduous teeth seem to have a greater recuperative power than those of the permanent teeth." It is well known that an adequate circulation of blood is an important factor in overcoming any tissue infection, and the fact that the deciduous tooth pulp is more vascular, by reason of the larger apical foramen, would seem to offer another reason that deciduous tooth pulps should respond more readily to pulp capping. However, there is a real need for the making of exhaustive records of pulp capping in both deciduous and permanent teeth to prove this. John C. Brauer, director of the DeLos L. Hill, Jr., Memorial Children's Clinic, of Atlanta, has begun a program which contemplates the observation of 300 or more cases of pulp capping during the next four or five years in deciduous and first permanent molars. He plans to check up every six months by means of the x-rays to determine whether physiologic resorption has taken place (in the case of deciduous teeth), and it is also planned to make histologic sections of the teeth as they are lost, to see what changes have taken place in the dentin and in the pulp of the tooth. He hopes to report his findings later.

Such a paper as this by Dr. Bodecker should be of great value to the general practitioner. The statement that only when the results of research are understood and applied in ordinary dental practice will the full benefit of such research be felt by the profession and the public will bear repetition.

THE DENTIST AND MODERN CONCEPTS OF HEART DISEASE

By Morris M. Weiss, M.D.,* Louisville, Ky.

THE past two decades have witnessed rapid developments in our knowledge and concept of heart disease. Probably the most important conception has been the classification of heart disease from an etiologic point of view. In the past, certain cardiac symptoms and signs were often diagnosed as simply "heart disease" or "cardiorenal disease." Another popular diagnosis was "chronic myocarditis." Or it was stated that the patient had "mitral insufficiency," "valvular heart disease" or possibly an "endocarditis." Today, the astute clinician is not satisfied unless he classifies the heart case on an etiologic basis.

This classification of heart diseases from an etiologic point of view has many obvious advantages. Primarily, it enables the physician to clearly understand disease entities. Thus, numerous causes for aortic insufficiency are found. Hence, in place of merely stating that a patient has such a lesion, if an etiologic diagnosis were made of syphilitic aortic insufficiency, or rheumatic aortic insufficiency, one would have a more comprehensive and clearer understanding of the patient's condition.

Again, the prognosis in heart disease is influenced by the etiology.[1] The case presenting auricular fibrillation, which is rheumatic in etiology, has an altogether different prognosis from one showing auricular fibrillation resulting from hyperthyroidism. Angina pectoris due to arteriosclerosis has a more favorable prognosis than that caused by syphilis. Many more examples could be given in which the etiology influences the prognosis. Finally, the proper management and treatment in heart disease depends on the etiology. Obviously, the patient with rheumatic heart disease should be treated in an altogether different manner from the one with hypertension as the basis for symptoms. A cardiac diagnosis is not complete unless a statement is made concerning the etiology of the pathologic and functional changes present.[2]

The following types of heart disease classified according to etiology comprise practically all accepted causes for diseases of the heart. Rarely, a case is encountered which must be placed in an unknown group. The types are not listed in order of their frequency.

1. Hypertensive.
2. Arteriosclerotic.
3. Rheumatic.
4. Syphilitic.
5. Hyperthyroid.
6. Hypothyroid.
7. Congenital.
8. Bacterial.
9. Traumatic.
10. Toxic.
11. Anemic.

Very often, heart disease has been included in the systemic diseases presumably caused by the presence of diseased teeth that are foci of infection. The dental literature is replete with such references. The following quotation from

(Read before the Louisville District Dental Society, Oct. 15, 1936.)

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Price's "Dental Infections and Degenerative Diseases,"[3] reflects the sentimental attitude of many dentists:

> How many of the one in ten funerals that go by your window because a heart has given out, have we as a dental profession either helped to produce or failed to prevent. As I dictate this paragraph, my memory goes back to patient after patient whose life has gone out prematurely at 40, 50 and 60 years of age, from heart involvement and other complications, but particularly with heart, and in whose mouths there were teeth which, according to my information at that time had not sufficient evidence of pathology to condemn. . . . I have no doubt that many of those patients, some of whom had come to be very dear friends, might have lived for years had I known to put into practice what I am now teaching in this book.

Despite the dental literature incriminating diseased teeth as the cause of heart disease of various types, and despite numerous reports of purported cures of patients with heart disease following the extraction of such teeth, I can find no worth while references in the medical literature. Not a single well-informed physician has written that any type of organic heart disease, with rare exceptions, is caused by dental focal infection. The accepted knowledge of the causes for different types of heart disease precludes any such statement. More than 95 per cent of heart disease is caused by hypertension, arteriosclerosis, rheumatic fever and syphilis.

Although infection has been held responsible for the development of hypertension and arteriosclerosis, their cause remains unknown. No one has been able to prove that they result from infectious dental conditions. Although all evidence points to a streptococcus, rheumatic fever is also of unknown etiology. At times, the portal of entry of the causative organism or virus seems to be the tonsils, but that this is the case has not been proved, and it likewise remains to be determined whether diseased teeth are the cause. Oral sepsis obviously is not responsible for syphilitic heart disease. The cardiac complications of a septicemia which in turn results from a dental abscess indicate a type of organic heart disease which might conceivably be considered dental in origin. However, aside from the infrequency of bacterial heart disease *per se*, a septicemia which results from a focus in the teeth is extremely rare. In contrast, cases of subacute bacterial endocarditis have been reported following the extraction of teeth.[4, 5, 6] It is also possible for severe anemia, which causes fatty degeneration of the heart muscle, to follow dental infection, but this sequence of events is not very common.

It is thus evident from the accepted causes of the etiologic types of heart disease that the dentist can prevent only certain rare cases.

Although persons with heart disease have dental infection, this is only a coincidence. From a statistical analysis of dental defects found in drafted men, Appleton[7] concluded that chronic dental infection was only a coincidental finding in those who had endocarditis. In a study of 883 college students, Arnett and Ennis[8] could find no statistically significant association of dental infection and heart disease in this group. The incidence of infection in deciduous teeth in children in whom systemic diseases was either proved or suspected was no greater, in the report of Ellis and Luten,[9] than in those in whom general disease was not present.

There is in the literature no statement, based on carefully controlled cases, that persons with organic heart disease will be cured by the eradication of oral sepsis. A high blood pressure may fall after the extraction of teeth, but this remission is temporary. Anesthesia and shock from any source could cause a transient lowering of the blood pressure in the hypertensive patient.

The conclusion must not be reached that foci of infection when present in the

cardiac case should not be eradicated. These infections lower general resistance; which is certainly a detriment to the person with heart disease. This lowered resistance can predispose the patient to upper respiratory tract infections, bronchitis and pneumonia. Such conditions are deleterious to the heart and may precipitate congestive failure. In a heart already decompensated, death might ensue. Hence, I recommend the removal of foci of infection in every cardiac case, but I do not delude myself that in so doing I am preventing or directly treating organic heart disease.

It is of interest to review a study, made by Horine and me, of the etiologic types of heart disease in professional men met in private practice.[10] There were only twenty-two dentists studied, but the figures are interesting: eight had hypertensive; three, arteriosclerotic; one, rheumatic, and ten, functional heart disease. The reasons for this high incidence of functional heart disease are clear. Dentists are on their feet practically the entire working day. In addition, the problems of the dental chair and the laboratory cause constant nerve strain. Many dentists eat as and when they can. Bowel and bladder habits are irregular. When to this is added no exercise and irregular hours at night, it is little wonder that functional heart conditions may develop. Much has been said concerning the disobedience of dentists and physicians as patients. My own impression is that, as a rule, they are very cooperative and philosophic when ill. Through a sense of duty and, at times, through economic necessity, they carry on with a fortitude that is amazing despite severe cardiac handicaps. But because they are cognizant of the danger and necessity for care, they usually make better patients than do laymen.

The necessity for the cautious administration of anesthetics to cardiac patients has been thoroughly discussed in the literature. It were best to be very careful about the use of a local anesthetic agent containing adrenalin. This particularly applies to the person with hypertensive and arteriosclerotic heart disease. In these patients, administration of adrenalin might cause an attack of angina pectoris. Nitrous oxide-oxygen anesthesia is very excellent and is preferred when the patient is very nervous and apprehensive or when the anesthetic effect of procaine has been materially lessened by the omission of adrenalin. Since the apprehension of operative procedures in the mouth has undoubtedly a more harmful effect than the anesthetic agent itself, it is advisable to administer a preoperative hypnotic. Rest and psychotherapy are valuable aids.

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Editorial Department

PAIN AND ITS PREVENTION

WE are constantly being told that one of the reasons that people do not more generally apply to the dentist for his services is dread of pain. Yet it has been the outstanding glory of our profession that it was a dentist who first introduced anesthesia to the world.

Somewhere between these two observations there must be a lot of give and take. No one can gainsay the great beneficence of anesthesia. It has been the one supreme blessing of humanity, and whatever glory may accrue as a result is justly ours. But there may be another side to the picture, a less attractive side. It is this to which we wish to call attention at the present time; not to seek to minimize the great blessing, but to turn another side to the canvas and mayhap present a slightly different picture.

Anesthesia as we practice it in dentistry may not be wholly an unmixed

blessing. What about the loss of healthy pulps following cavity preparation when anesthesia is used? Too many pulps have been lost in this way, and more will be lost unless our operators exhibit greater caution. It may be true that, in the past, there was too pronounced a tendency toward indifference to the infliction of pain, whereby many patients were needlessly prejudiced against dental operations, but now the pendulum has swung to the other extreme, where patients are schooled to the idea that the proper thing is to make certain that no discomfort of any kind must be tolerated. We are not at all sure that it is perfectly safe to employ anesthesia as generally as we do. We would not think for a moment of doing without anesthesia: we would be utterly lost without it; but by its use we may unwittingly be fostering a generation lacking in stamina of any kind. The constant practice of doping ourselves at every slight discomfort to relieve pain is not wholesome nor is it conducive to the development of a normal or rational amount of stamina.

There are already too many indications of a tendency toward softness in our modern lives. We hear very little today of the Spartan type that at one time formed the bone and sinew of our every-day life. We are not arguing for unnecessary suffering—far from it—but we should face the fact that life in the very nature of things involves a certain amount of discomfort, and if we strive too hard to avoid it, or if we shirk the normal issues of life, we do so at our peril. Facing facts should not be considered undesirable, no matter where the facts lead us.

Not only that, but, in this question of anesthesia, we are told that there may be an element of actual danger in the too prevalent use of anesthetics. The *Science News Letter* for March 19, 1938, contains an article on "Danger to Heart in Local Anesthetics." The article follows:

> A warning to dentists advising care in the use of procaine-epinephrine local anesthetics was issued by University of Chicago scientists after more than a year of experimentation.
>
> These anesthetics, injected into the gums to eliminate pain, are found to cause marked rises in blood pressure, sometimes toxic reactions and may be dangerous to the heart. Although widely used in dental practice, there has been insufficient research upon their dental and medical use, the report in the *Proceedings of the Society of Experimental Biology and Medicine* states.
>
> The research was by Drs. Paul P. Pickering and Herbert P. Steinmeyer of the Walter G. Zoller Memorial Dental Clinic and Dr. Arno B. Luckhardt, who in 1923 discovered the anesthetic properties of ethylene gas.

This does not mean that we seek to work up a scare against the legitimate use of these agents. They have, in too many instances, demonstrated their efficacy to justify their elimination, but at least there is

strong warrant for a word of warning in their use, and a rational argument against rushing pell-mell into anesthesia without due deliberation. Caution is merely legitimate conservatism, and we need both in the practice of our profession.

MAY DAY—CHILD HEALTH DAY

THE slogan for the 1938 observance of May Day—Child Health Day—is "Speed Children on the Road to Health," as announced by Katharine F. Lenroot, Chief of the Children's Bureau of the United States Department of Labor.

In 1928 a congressional resolution authorized the President of the United States to proclaim May Day as Child Health Day. This year marks the tenth anniversary of the custom, and the objective of this year's celebration will be to urge every community to make full use of all resources that will assure every child safe birth, normal growth and protection against disease and accident on the road from infancy to maturity.

The observance of the May Day celebration and the accomplishment of the objective of the slogan "Speed Children on the Road to Health" may well and fittingly supplement the health objective of the American Dental Association as embodied in the purposeful slogan of its President, Dr. Camalier—"Dental Health for American Youth." This objective is being diligently pursued by all the promotional health forces of the American Dental Association, and promise of magnificent fulfilment is becoming manifest.

As May Day this year falls on Sunday, supplementary observance will be held on Saturday, April 30, and on Monday, May 2, and all state and local public agencies, as well as private organizations, are urged to plan May Day activities and programs that will contribute to year-round child health activities. State departments of education are also urged to cooperate with the general movement in planning Health Day programs for school children.

In many communities, these programs will be so coordinated that while their elders are planning ways and means for speeding them on the road to health, the children will engage in demonstrations, plays, games and festivities illustrating the health needs of the younger generation and the

progress made during the year in the knowledge concerning the protection of their own health and the general health of the community.

"Dental Health for the American Youth" will be a subordinate but a very important note in the general health program, and every dentist in every community is urged to contribute his share toward better dental education for better dental health for the childhood of the nation and toward the accomplishment of the purpose of the child health program for "Dental Health for American Youth."

A "HUMANE POUND LAW" PROPOSED IN CALIFORNIA

In the light of the advance made in medical science in the past, much of which may be directly attributed to knowledge of disease gained through animal experimentation, it would seem that the benefits which have accrued to humanity from this source would have been appreciated by every one sufficiently to eliminate all possible objection to this indispensable adjunct to medical research. Such is not the case, however, as is evidenced by the efforts of some misguided, self-styled humanitarians to obstruct the conduct of biologic research which demands the use of dogs in furthering the efforts of the medical profession toward the alleviation of human suffering.

In California, it is proposed to submit to the voters, for approval or otherwise, a bill which, if sanctioned, will be presented to the Legislature under the title of the "Humane Pound Law," in which prohibition is placed upon the delivery of unclaimed stray dogs to medical research institutions for experimental purposes. Thus, for the sake of an overzealous sentimentality for animals, the voters of California are asked to approve a procedure which would preclude the prevention or alleviation of untold human suffering. The adoption of such a bill would practically eliminate further biological experimentation upon dogs, a phase of animal experimentation which has proved most valuable in the prevention and control of infant diseases—the direction in which the research work of many decades has been pursued and in which it has been most conspicuously successful.

It is inconceivable that the lives of the babies of the nation, as well as the lives of adults of practically all ages, should be weighed against a fanatical sentimentality toward the lives of stray dogs that are acknowl-

edgedly a dangerous menace in many instances to the life, health and happiness of children. We do not believe that such a sentiment will prevail in California, and we sincerely hope that it will not, not only for the sake of the citizens of that State, but also for the citizenship of the entire nation, for the reason that if the law is passed in California, it will only be a signal of encouragement for similar laws and similar efforts in all other states.

The "Humane Pound Law" would appear to be directed toward the prevention of cruelty to animals, such as the dog, and its proponents are appealing for help and cooperation from the welfare institutions all over the country on the basis of the claim that other animals are just as suitable for all phases of biological and medical experimental purposes, but such is not the case. Certain animals lend themselves to experimentation in certain diseases, and the horse and dog have been employed most usefully; in fact, it has been found that they are the only animals suitable for experimental research relating to certain kinds of diseases.

Then, too, the sources of supply of dogs for experimental purposes are exceedingly limited and confined to public pound sources because of the impracticability of raising dogs for this special purpose. The expense of such a source of supply would be practically prohibitive. The public pound, then, appears to be the logical source for securing one kind of animal most valuable to the research efforts of medicine and this source should be encouraged rather than removed.

Section 10 of the law under consideration states, "It is unlawful for any poundmaster or assistant to use or permit to be used any live animal in his custody for experimental or commercial purposes or to turn over, with or without remuneration, directly or by any indirect ways or means, any dog, cat or other animal in his custody . . . to any person, school, university, research laboratory or experimental station to be used for educational demonstration, medical, scientific and/or experimental purposes of any nature."

We cannot estimate with any degree of accuracy the amount of good in disease prevention that research on animals has done for man, but we are reasonably sure that it has been such as to greatly lessen all types of disease, as well as lengthen the average human life span. We can only speculate on the benefits of disease prevention and elimination on much the same basis as Andrew Carnegie estimated the advance of civilization. He once said, "If you want to realize the progress we have made, look back and see from whence we came." If we want to realize the

progress made in prevention of disease, look back and see the myriads of diseases that have been practically eliminated from the scourges of mankind, and mainly through animal experimentation. And some of the most serious of these diseases have only yielded up the secrets of their etiology and control through experimental researches conducted on the dog.

On the question of cruelty of subjecting dogs to experiments, no one who has seen such experimental work can believe the fancied charge of cruelty made by the "antivivisectionists." This might have been true in a measure before the discovery of anesthesia, but that discovery, to which incidentally the dog contributed much, has been the means of relief from practically all necessary pain in experimental work.

We rely upon the good judgment of our California friends to resist this fallacious attempt to test their humanitarianism, confident in the belief that they will reject such an insidious effort at subversion of the health welfare of the state and nation. L. P. A.

OBITUARIES

WILLIAM S. DAVENPORT

(1869-1938)

William Slocum Davenport, Sr., American dentist and artist, of Paris, France, died February 26 of a heart attack induced by bronchopneumonia. Funeral services were held at his estate in suburban Malmaison. Dr. Davenport was born in 1869 in Binghamton, N. Y., one of the famous Davenport dental family. Soon after acquiring his D.D.S. degree in this country, he established himself in Paris, where he practiced for forty-seven years.

Dr. Davenport was dentist to the Belgian royal family and was a friend of the late King Albert. For personal services to the royal house, he was made a Knight of the Order of Leopold. He was made an Officer of the Legion of Honor in 1930. In his youth, he was a friend of James Abbott McNeill Whistler, the painter, and he was almost as well known as a painter as he was as a dentist. His paintings are in several American museums, including the Brooklyn Museum, and for many years his work was exhibited in Paris.

In 1897, after the great fire in the Charity Bazaar in Paris, Dr. Davenport and his brother, Dr. Isaac B. Davenport, established the identity of the Duchesse d'Alencon's body by means of the teeth. It was the first time, it is said, that courts had accepted such identification.

During the World War, Dr. Davenport served in the American Ambulance Corps as assistant chief of the face and jaw section, and his surgical reconstruction work was regarded as remarkable. It was for this service that he was made an Officer of the Legion of Honor.

His wife, Mrs. Nona Davenport, two daughters, Mrs. William Douglas Read and Mrs. George H. Steen, and a son, William S. Davenport, Jr., who also is a dentist, survive.

ALFRED C. FONES
(1869-1938)

ALFRED C. FONES, D.D.S., died at his home in Bridgeport, Conn., from a heart attack, March 16, 1938, in his sixty-ninth year.

ALFRED C. FONES, D.D.S.
(1869-1938)

Dr. Fones was born in Bridgeport, December 17, 1869. He attended the New York College of Dentistry, from which he graduated in 1890. He returned to Bridgeport and formed a partnership with his father, Dr. Civilian Fones, which lasted until the latter's death.

Dr. Fones was an outstanding figure in the dental profession and had received practically all of the honors which could be bestowed on him by the professional world. He had served as president of the Bridgeport Dental Society, and of

the Connecticut State Dental Association. He was one of the founders of the Junior College of Connecticut, and for some years had been chairman of the board of trustees of that institution.

For his pioneer work in the movement to train dental hygienists and establish dental clinics in schools, he was awarded the William Jarvie Fellowship Medal for 1926, in Buffalo, an award given each year by the New York State Dental Society for outstanding achievement in the dental profession. In 1922, he was awarded by the Connecticut State Dental Association the Newell Sills Jenkins Memorial Medal, which is also one of the highest honors that can be given a dentist.

Dr. Fones originated the idea of instructing children regarding the prevention of tooth decay and training dental hygienists to carry on the prevention work. In 1913, he established the Fones Clinic for Dental Hygienists, in Bridgeport. The first class of students graduated in June 1914. Dr. Fones laid the foundations for teaching children the care of their teeth as a part of the curriculum of schools throughout the world through his scientific writings and contributions to the literature of his profession. Since he started training dental hygienists, the work has been taken up throughout the United States. In 1920, Dr. Fones accepted an invitation to go to Hawaii to install his system for the care of the teeth of the children in the schools there.

Of Bridgeport's native sons who have become nationally distinguished for their services in special fields, Dr. Fones stood among the foremost. In the profession of dentistry, he was recognized by national honors repeatedly conferred on him by his colleagues. At home, he was known not only as one of the outstanding members of his profession but also as a man of broad humanity and civic vision, a man who saw far beyond the confines of his own immediate problems and tried to extend the benefits of modern knowledge to all the people.

In the last century, the great advances in medical science have been in the realm of preventive medicine. The public has benefited far more from education in the prevention of disease than by discoveries leading to cure. In teaching the prevention of dental disease, Dr. Fones was a pioneer, a propagandist, an ardent enthusiast and a great benefactor to the school children of America.

Dr. Fones cherished this ideal: a heritage of sound healthy teeth in the mouth of every child. Of course, the ideal was not attainable in practice, but Dr. Fones, more than any other individual, gave impetus to the movement to arrest and prevent the destruction of the teeth of the growing generation through faulty nutrition, lax dental hygiene or neglect.

Those who were privileged to know Al Fones more or less intimately will mourn his loss as a friend and next as a benefactor to the children of Bridgeport and the nation at large, to whose health and happiness he early in his career consecrated his civic life and professional aspirations. Unusual responsibilities, civic and professional, fell upon his shoulders, but he accepted them and fulfilled them as was befitting the noble character that was his. A loyal, constant and true friend, a cultured and courteous gentleman at all times and on all occasions, he was a distinct adornment to the dental profession, to the civic life of Bridgeport and to the nation at large as a benefactor of the children of the nation.

Dr. Fones was married to Miss Elizabeth Harwood of Joliet, Ill., when a young man, and her loyalty and devotion were conspicuous factors in the successful career of her husband. Her death in 1930 was a loss which bore heavily upon Dr. Fones in his later years.

CHARLES F. ASH
(1870-1938)

CHARLES FREDERICK ASH, D.D.S., died at his home in Bound Brook, N. J., January 25, 1938, in his sixty-ninth year.

Dr. Ash was born in Brooklyn, N. Y., January 2, 1870, the son of Kathryn (Blake) and Matthew Ash. He received his early education in the public schools of Brooklyn. He early developed the desire to become a dentist, and at the age of 17 began preparation for the regents' examination and later entered New York University Dental College, from which institution he received his D.D.S. degree. He began practice in Brooklyn in 1894. In 1908, he removed to New York City and established at 115 Broadway an office which he maintained until his retirement in 1937.

CHARLES F. ASH, D.D.S.
(1870-1938)

Dr. Ash was from the very beginning of his career an active participant in the affairs of dentistry, to which he contributed

notably in every way. His death takes from dentistry one of its leading proponents and a man who was for many years a credit to dentistry in all for which it stands as a profession.

The respect and honor in which Charlie Ash was held by his confrères is well portrayed by tributes (herewith) from two of his closest friends.

HAIL, COMRADE—FAREWELL, FRIEND

The passing from mortal life of Charles F. Ash has left a vacant place in the councils of the dental profession and in the lives of many of widely diverse walks of life that never can be quite filled. Others will grow, as he did, from the lowly start and along the long toilsome road of hardships and discouragements, surmounting them in succession, gaining strength from each victory and winning through to high place and wide esteem.

No other ever will be quite like "Charlie" Ash—the man whose smile, hand clasp, sympathy, compassion, counsel and material aid were ever ready for those who needed and deserved them and whose scorn for deception and meanness could sting like a lash.

The list of his contributions to dental literature does not belong in this personal tribute and a list of his official positions will not add to its value for those of us who are saddened by his absence. A list of the positions he declined would illustrate better his evaluation by his fellowmen. Let it suffice to record that he wrote and he served to aid his profession and that he declined high place unless there was opportunity for service. The esteem of those with whom he worked shoulder to shoulder gave him great satisfaction; hence, he valued the unique distinction of having been president of the First and the Second District Dental societies. Above this stood his satisfaction in contributing to the leadership and counsels of any movement that meant service to those in need. His participation in the leadership of the Preparedness League of American Dentists in the World War and his earnest work with a club of underprivileged boys are examples of this. The countless times when his counsel and his material aid meant the turning point for some one between despair and hope are known only to the recording angel.

To stand quietly in the background furthering and guiding some worthwhile activity was ever a source of deep satisfaction for him. When he could see fruition of his hopes and ambitions for such a movement, he was content to let others stand in the spotlight and garner the applause.

Dr. Ash's ability made him a man respected; his achievements, a man admired, and his loyalty and understanding sympathy, a man loved by those whose paths brought them close to his.

HENRY W. GILLETT.

CHARLES F. ASH

IN MEMORIAM

Once more the Shadowy Angel has slipped into our midst and laid its lethal hand on one of the notables of our profession.

It seems but yesterday that I sat shoulder to shoulder with him at the last rites for "Billy" Tracy and I recall the comfort that his nearness gave me in that sad hour.

And now "Charlie" has gone—out from this abode of Life, through "The Veil that Hides the Future," to that Beyond where lies Eternity; and my sense of loss is shared by hundreds who were fortunate enough to know him as I did.

We knew him to be

Great of heart and mind and of attainment in our profession.

Sound of judgment, skilful in operating, ingenious in difficult planning.

Of calm and constant courage in times of misfortune and panic—the very soul of generosity. He was a "Tower of Refuge" to the friend whom calamity threatened. No one who deserved help ever appealed to him in vain, and often he gave on knowing it was needed without waiting for the appeal.

Such was his personality that he won friends easily, such his loyalty that, without effort, he held them securely.

He too was a shining credit to the profession and "the acid test of Time" left his reputation only the more brilliant.

He too won the deserved rank of Nature's Nobleman.

In the sad hearts of those of us who knew him so well that we loved him, there sounds

the wistful melody of his requiem. We shall miss him through the days of life that may be left to us. We hope to meet him again when we too shall have passed the last threshold of Time.

J. E. Nyman.

Dr. Ash was the modest recipient of many honors in dentistry, some of which are here noted. He was past president of the Second District Dental Society of New York and of the First District Dental Society of New York. Both of these had elected him honorary life member. He was honorary member of the American Dental Society of Europe; past president of the Brooklyn Dental Society; Past First Vice President of American Dental Association and had refused the nomination for President, and past supreme grand master of the Delta Sigma Delta Fraternity.

For a number of years, he was active in and a director of the Boys Club of New York, Bowling Green Neighborhood Association and Beekman Street Hospital. He was a member of the Camp Fire Club of America, Bankers Club of New York and Lotus Club. During the World War, he was director general of the Preparedness League of American Dentists. He was a life member of the First District Dental Society. In 1922, he was elected to Fellowship in the New York Academy of Dentistry.

Dr. Ash was married in 1896 to Miss Lucretia Durfey of Brooklyn, N. Y., who, with a son and a daughter, survives him.

Interment was in the Presbyterian sanctuary, Bound Brook, N. J.

THEODORE B. BEUST

(1871-1937)

Theodore Bernhard Beust, M.D., D.D.S., professor of oral histology at the School of Dentistry, University of Louisville, and for a long time prominent in the field of dental research, died on November 24, 1937. Dr. Beust was born in New Albany, Ind., in 1871. He was graduated from the Louisville College of Dentistry and the Hospital College of Medicine at Louisville, Ky.

Dr. Beust began the practice of dentistry in New Albany in 1892, and later established practice in Dresden, Germany (1897). Returning to the United States in 1916, he became associated with the Louisville College of Dentistry. Dr. Beust was an enthusiastic and thorough worker in the field of dental research. He was at various times chairman of the Research Section of the American Dental Association, and also served as president of the International Association for Dental Research in 1935, and chairman of the Louisville Section of that association.

DR. FRANK A. DELABARRE

It is with much sadness that we announce the death of Dr. Frank A. Delabarre, Boston, Mass., which occurred April 15. A fuller obituary notice will appear in a later issue.

DR. WILLIAM BEBB

We also regret to announce the death of Dr. William Bebb, Spencer, Ind., which occurred April 6. An obituary notice of Dr. Bebb will be published in a later issue of The Journal.

COUNCIL ON DENTAL THERAPEUTICS

DENTURE REBASING MATERIALS CONTAINING ACETONE

The following informative article has been authorized for publication by the Council on Dental Therapeutics.

SNUGFIT, a preparation sold for the rebasing of dentures without the assistance of dentists, has recently been the subject of a Cease and Desist order by the Federal Trade Commission because of false and misleading advertising.

This product is not new in the files of the Council. Late in 1936, the Council's office received an inquiry concerning it from a broadcasting station in the Middlewest. On the advice of the former secretary of the Council, the account for the product was discontinued. This action was followed by a letter from the advertising agency handling the product, who wrote that the action surprised them since they had been handling the account for a considerable period of time and this was the first unfavorable report on the product. This advertising agency was advised that chemical tests on the solvent part of Snugfit showed it to contain acetone and, further, that acetone could not be placed indiscriminately in the mouth. Furthermore, the agency was informed that inhalation of acetone is known to produce bronchial irritation and stupor, although serious injury is rare.

A preliminary examination of the paste part indicated the presence of finely powdered aluminum in a binding material, held together with acetone. This hardened when treated with water above room temperature.

The Council's office emphasized to the broadcasting company that the correction of dentures is a matter that requires not only mechanical skill but also an understanding of the biologic principles underlying the preparation of a denture. Improper fitting of dentures may have undesirable results. Constant irritation may lead to cancer.

Now a press release, dated October 3, 1937, from the Federal Trade Commission, comes to hand. This is reproduced for the information of the dental profession.

EARLE J. HANSCH, an individual trading as SNUGFIT COMPANY, Los Angeles, California, vendor-advertiser, is engaged in selling a dental preparation designated SNUGFIT, and in advertising represented:

"PLATE COMFORT. If you have trouble with plate slipping, or if your gums recede with resulting loosening of plates, you can readily overcome this trouble . . . you can correct plate trouble, making a solid suction plate that is 'tailor-made' to gums, mouth-roof . . . SNUGFIT."

"SNUGFIT flows into position, filling all depressions, and gives a perfect adaptation of plate to mouth tissues. From this comes the suction necessary to hold your plate in position."

"SNUGFIT actually relines the plate to fit the exact crevices of the mouth."

"When it has finally hardened it has set to the exact impression of his mouth."

"There's just no more slipping!"

"When you apply SNUGFIT to a dental plate it really becomes part of the plate itself. That's why its snugfitting comfort is permanent."

"Nothing will remove SNUGFIT from the plate except this solvent."

"End plate troubles for good with SNUG-FIT."

The respondent admits that:

"Because of the shrinkage of gums it is necessary for dental plates to be refitted from time to time, and the use of respondent's product will not assure permanent benefits; nor can the product be depended upon to produce in all cases the results represented, in the advertising claims herein-before stated."

In a stipulation filed and approved by the Federal Trade Commission, the vendor-advertiser admits making such representations and specifically stipulates and agrees in soliciting the sale of and selling said product in interstate commerce to cease and desist from representing directly or otherwise:

(a) That by use of the product one can "correct" plate trouble; (b) that by use of the product one can "overcome" loosening or slipping of the plates; (c) that the product fills in "all" depressions; (d) that the product gives a "perfect" adaptation of plate to mouth tissues; (e) that by use of the product the suction necessary to hold the plate in position will come; (f) that the product relines the plate to fit the "exact" crevices of the mouth; (g) that by the use of the product "There's just no more slipping"; (h) that any comfort which may be derived by use of the product is permanent; (i) that nothing will remove the product from the plate except the solvent; (j) that one can end plate troubles with the product; and from making any other claims or assertions of like import.

It may be pointed out that these "easy" denture rebasing materials are sold to the profession also. Several of those which have been examined cursorily were found to contain acetone.

Although such a product appears to be, on the face of it, a prosthetic product, because of the shrinkage of the gums involved and because of the possible toxicity to wounded tissues, it cannot be divorced from its toxicologic aspects. This report is therefore being made for the information of the dental profession.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

DENTIFRICES*

Nevins Tooth Paste.—Composition: See Craig-Martin Tooth Paste (A.D.R. 1937, p. 107).

Manufactured by Comfort Manufacturing Co., Chicago, Ill. Distributed by Nevins Drug Company, Philadelphia, Pa. No U. S. patent or trademark.

Hopkins Tooth Paste.—Composition: See Sheffield Tooth Paste (A.D.R. 1937, p. 110).

Manufactured by the Sheffield Company, New London, Conn. Distributed by Read Drug and Chemical Co., Baltimore, Md. No U. S. patent or trademark.

Wolf Tooth Paste.—Composition: See Sheffield Tooth Paste (A.D.R. 1937, p. 110).

Manufactured by the Sheffield Company, New London, Conn. Distributed by Wolf Drug Company, Newark, N. J. No U. S. patent or trademark.

Avona Tooth Paste.—Composition: See Sheffield Tooth Paste (A.D.R. 1937, p. 110).

Manufactured by the Sheffield Company, New London, Conn. Distributed by Jordan Marsh Company, Boston, Mass. No U. S. patent or trademark.

ARSENIC COMPOUNDS†

Arsphenamine-Merck: A brand of arsphenamine, U.S.P. (See A.D.R. 1937, p. 62.)

Arsphenamine-Merck, 3.0 gm. ampules

*A.D.R. 1937, p. 105.
†A.D.R. 1937, p. 59.

Neoarsphenamine-Merck: A brand of neoarsphenamine, U.S.P. (See A.D.R. 1937, p. 63.)

Neoarsphenamine-Merck, 3.0 gm. ampules

Sulfarsphenamine-Merck: A brand of sulfarsphenamine, N.N.R. (See A.D.R. 1937, p. 65.)

Sulfarsphenamine-Merck, 0.1 gm. ampules
Sulfarsphenamine-Merck, 0.2 gm. ampules
Sulfarsphenamine-Merck, 0.3 gm. ampules
Sulfarsphenamine-Merck, 0.4 gm. ampules
Sulfarsphenamine-Merck, 0.5 gm. ampules
Sulfarsphenamine-Merck, 3.0 gm. ampules

Manufactured by Merck & Co., Inc., Rahway, New Jersey. No U. S. patents or trademarks.

ANESTHETICS—LOCAL‡

Procaine Butyrate.—β-diethylaminoethyl-p-aminobenzoate isobutyrate. $C_4H_4NH_2COO.C_2H_4N(C_2H_5)_2.C_4H_8O_2$. A butyrate formed by the interaction of β-diethylaminoethyl-p-aminobenzoate (procaine base) and isobutyric acid. Procaine butyrate contains 72.84 per cent of p-amino-benzoyl-diethylaminoethanol.

ACTIONS AND USES: Procaine butyrate closely resembles procaine hydrochloride in its actions and uses. The molecule is heavier than that of procaine hydrochloride, but the toxicity and anesthetic activity are closely proportional to those of the procaine base which they contain. When injected subcutaneously, procaine butyrate exerts a powerful anesthetic action. Procaine butyrate has been suggested for topical anesthesia, but insufficient evidence has been presented to justify the claim to date.

DOSAGE: See Procaine Hydrochloride, U.S.P. Procaine butyrate responds to the tests for procaine hydrochloride as far as they pertain to the base. Dissolve 0.3 gm. of procaine butyrate in 5 cc. of distilled water in a separatory funnel. Add 25 cc. of chloroform and 1 cc. of ammonium hydroxide 10 per cent. Extract with five successive portions of chloroform. Collect the extract in a small flask. Distil extract to a volume of about 10 cc. Add 10 cc. of tenth normal sulfuric acid and heat on a water bath until all chloroform is driven off. Titrate back with fiftieth normal sodium hydroxide, using methyl red as indicator. Each cubic centimeter of tenth normal sulfuric acid is equivalent to 0.032423 gm. of procaine butyrate.

Manufactured by William H. Rorer, Incorporated, Philadelphia, Pa. U. S. patent applied for. No U. S. trademark.

Procaine Butyrate Solution 2% with Epinephrine 1:50,000-Rorer: Each cubic centimeter contains procaine butyrate 0.02 gm.; epinephrine, 0.00002 gm.; thymol, 0.0002 gm.; sodium bisulfite, 0.0019 gm.; chlorobutanol (chloroform derivative), less than 0.5 per cent, and sodium chloride solution q.s. to render isotonic.

Procaine Butyrate Solution 2% with Epinephrine 1:50,000-Rorer in 2.5 cc. cartridges (hypotubes).

Procaine Butyrate Solution 2% with Epinephrine 1:25,000-Rorer: Each cubic centimeter contains procaine butyrate 0.02 gm.; epinephrine, 0.00004 gm.; thymol, 0.0002 gm.; sodium bisulfite, 0.0019 gm.; chlorobutanol (chloroform derivative) less than 0.5 per cent, and sodium chloride solution q.s. to render isotonic.

Procaine Butyrate Solution 2% with Epinephrine 1:25,000-Rorer in 2.5 cc. cartridges (hypotubes).

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

‡A.D.R. 1937, p. 36.

ASSOCIATION ACTIVITIES

COMMITTEE ON LEGISLATION

POWER TO REGULATE PRACTICE

It has been contended, on many occasions, that the state has no power to interfere with the right of the individual to pursue any vocation that he may desire to follow. This contention has not been upheld in the courts of the states when the question has been that of dentistry. The State of Washington enacted a code which provided, among other things, that a person must obtain a license before engaging in the practice of dentistry. The code was upheld by the supreme court of that state in the case of State v. Thompson, 94 Pac. 667; 48 Wash. 683. (1908). The court again upheld the act in 1910, in the case of Brown v. State, 59 Wash. 195.

The requirement that a license must first be secured or else the practice of dentistry is a crime came in for consideration and court action in the case of State v. Sexton, 37 Wash. 110. (1905). Years later, the court again ruled on that particular point in a revised enactment, and held that examination and licensing of dentists is constitutional. (Noble v. Dibble, 119 Wash. 509. 1922.)

Making the illegal practice of dentistry a public offense is within the power of the legislature and was so held by the New Jersey court in the case of Lowrie v. State Board of Registration and Examination, 90 N. J. L. 54; 99 Atl. 927.

Section 194 of the Public Health Law of New York, which specifically permits the practice of dentistry by those licensed thereunder, was upheld as constitutional by the supreme court of New York in People v. Griswold, 213 N. Y. 92; 106 N. E. 929.

LEGISLATIVE NEWS ITEMS

District of Columbia

A bill amending the District of Columbia Act for the regulation of the practice of dentistry and the protection of the people from empiricism in relation thereto was introduced in Congress by Senator King of Utah on March 1, 1938.

This bill is endorsed by the Dental Society of the District of Columbia.

Oklahoma

A modern dental law recently enacted in Oklahoma makes membership in a state association of licensed dentists compulsory for all practitioners of dentistry in the state.

Authority to enforce the provisions of the act is vested in a board of dental examiners. Appeal from their decisions may be heard only by the state supreme court.

A review of this state law will appear in an early issue of THE JOURNAL.

NATIONAL BOARD OF DENTAL EXAMINERS

In the July issue of the Journal of the American Dental Association, there appeared an article entitled "The National Board of Dental Examiners." In that article, the statement was made that the National Association of Dental Examiners is a member of the National Board. The National Association of Dental Examiners has not been a participant since November 1935.

There was no desire to misstate any facts, and being the author of the above mentioned article, I regret any misunderstanding or embarrassment to any person or group thereby.

MORTON J. LOEB, *Secretary,*
National Board of Dental Examiners.

AMERICAN DENTAL ASSOCIATION 1937 MEMBERSHIP RECORD*

The following percentages have been obtained on quotas for constituent societies on the basis of a total membership of 45,000.

	PERCENTAGE
Alabama	78.80
Arizona	96.81
Arkansas	80.33
California	86.58
Southern California	86.58
Colorado	101.04
Connecticut	138.13
Delaware	104.70
District of Columbia	126.69
Florida	103.23
Georgia	78.75
Idaho	75.66
Illinois	100.13
Indiana	91.05
Iowa	100.84
Kansas	79.49
Kentucky	99.80
Louisiana	73.42
Maine	77.82
Maryland	77.84
Massachusetts	81.97
Michigan	113.55
Minnesota	130.89
Mississippi	86.01
Missouri	83.58
Montana	103.28
Nebraska	98.39
Nevada	70.73
New Hampshire	101.37
New Jersey	126.62
New Mexico	123.81
New York	74.53
North Carolina	105.30
North Dakota	92.31
Ohio	94.40
Oklahoma	87.40
Oregon	76.48
Pennsylvania	95.70
Rhode Island	73.75
South Carolina	68.16
South Dakota	84.40
Tennessee	105.03
Texas	80.50
Utah	114.15
Vermont	101.03
Virginia	107.90
Washington	83.66
West Virginia	85.62
Wisconsin	100.52
Wyoming	108.82

*As of February 28, 1938.

	NUMBER OF MEMBERS†
Alabama	317
Arizona	91
Arkansas	195
Army	179
California State	1,582
Southern California	1,406

†As of December 31, 1937.

Colorado	471
Connecticut	830
Delaware	67
District of Columbia	413
Florida	447
Foreign	22
Georgia	455
Idaho	115
Illinois	3,771
Indiana	1,077
Iowa	1,083
Hawaii	126
Kansas	535
Kentucky	542
Louisiana	338
Maine	206
Maryland	403
Massachusetts	1,744
Michigan	1,782
Minnesota	1,609
Mississippi	235
Missouri	1,298
Montana	187
Nebraska	610
Nevada	29
New Hampshire	146
New Jersey	1,893
New Mexico	78
New York	4,524
North Carolina	517
North Dakota	180
Navy	165
Ohio	2,325
Oklahoma	444
Oregon	426
Pennsylvania	3,533
Public Health Service	103
Puerto Rico	54
Rhode Island	177
South Carolina	166
South Dakota	184
Tennessee	543
Texas	1,007
Utah	234
Vermont	99
Virginia	533
Washington	687
West Virginia	358
Wisconsin	1,358
Wyoming	74
U. S. Veterans Administration	106
Panama Canal Zone	20
Total (regular members)	42,099

JUNIOR MEMBERSHIP†

Atlanta Southern Dental College	23
Baylor University	66
Chicago College of Dental Surgery	182
College of Physicians and Surgeons	99
Columbia University	56
Creighton University	18
Georgetown University	98
Harvard University	9
Indiana University	94
Kansas City-Western Dental College	81
Loyola University (La.)	30
Marquette University	95
Medical College of Virginia	32
New York University	50
North Pacific College of Oregon	27
Northwestern University	18
Ohio State University	118
State University of Iowa	57
Temple University	119
Texas Dental College	68
Tufts College	0
University of California	20
University of Buffalo	25
University of Detroit	33
University of Illinois	43
University of Louisville	11
University of Maryland	66
University of Michigan	31
University of Minnesota	63
University of Nebraska	11
University of Pennsylvania	13
University of Pittsburgh	9
University of Southern California	152
University of Tennessee	6
Washington University	10
Western Reserve University	94
Total	1,927

†As of March 31, 1938.

American Dental Association

St. Louis, Missouri October 24-28, 1938

HOTEL RESERVATIONS

To secure hotel accommodations for the 1938 Session, consult the rate list and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 108, Hotel Statler, St. Louis, Mo. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

St. Louis, Mo. October 24-28, 1938

HOTEL.....1st choice

HOTEL.....2nd choice

HOTEL.....3rd choice

Kindly reserve the following:

.....Rooms with bath for.....persons $.....per room

.....Rooms without bath for.....persons $.....per room

Arriving on October.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL
.....	.....
.....	.....
.....	.....

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make the reservation requested, this application should be forwarded at once to the Housing Committee, Room 108, Hotel Statler, St. Louis, Mo.

SCHEDULE OF RATES

ALL ROOMS WITH BATH*

Hotels	*Single*	*Double*	*Twin Beds*
AMERICAN 6 North 7th St.	$2.50	$4.00	$5.00
AUDITORIUM 1803 Pine St.	2.50	3.50	4.50
BILTMORE 3643 Washington Blvd.	1.50	2.50	3.00
CHASE 212 N. Kingshighway Blvd.	2.50–3.00–3.50–4.00 Apartments (4 persons), 12.00	4.00–5.00–6.00	5.00–6.00
CLARIDGE 18th and Locust St.	2.00–2.50–3.00	4.00–4.50–5.00	4.00–4.50–5.00 6.00
CONGRESS 275 N. Union Blvd.			6.00
DESOTO 1014 Locust St.	2.00–2.50–3.00	3.00–3.50–4.00	3.50–4.00–5.00 6.00
CORONADO 3701 Lindell Blvd.	2.50–3.00–3.50 4.00–4.50–5.00–6.00 Parlors (wall beds), 5.00 single; 6.00 double 2 room suites (3 persons), 7.50 Parlor suites, 5.00–6.00–7.00–8.00–9.00 10.00–11.00–12.00	3.50–4.00–4.50 5.00–6.00	4.00–4.50–5.00 5.50–6.00–7.00
FAIRGROUNDS 3644 Natural Bridge Blvd.	2.00–2.50	3.00–4.00	
FOREST PARK 4910 W. Pine Blvd.	3.00 Apartments (2-4 persons), 3.00 person		4.00–6.00
GATESWORTH 245 Union Blvd.	3.00 Suites (4 persons), 8.00	4.00	5.00

*Extra cot, $1.00. Rates on rooms without bath on request.

SCHEDULE OF RATES (Continued)

Hotels	*Single*	*Double*	*Twin Beds*
JEFFERSON 415 North 12th Blvd.	$3.00–3.50–4.00 4.50–5.00–5.50 Suites (single), 6.00 8.00–10.00–17.50 Suites (double), 8.00 12.00–19.50	$4.00–4.50–5.00 5.50–6.00–7.00 7.50	$5.00–6.00–7.00 7.50–8.00
KINGS-WAY 108 N. Kingshighway Blvd.	2.00–2.50–3.00–3.50 Suites, 5.00–6.00–7.00 8.00	3.00–3.50–4.00	4.00–5.00–6.00
LENNOX 825 Washington Ave.	3.00–3.50–4.00	4.50–5.00–5.50 6.00	5.00–5.50–6.00 6.50–7.00
MAJESTIC 200 North 11th St.	3.00	4.00–5.00	6.00
MARK TWAIN 116 North 8th St.	2.00	3.50–4.00–4.50	4.50–5.00–5.50
MARQUETTE 18th and Washington Blvd.		3.00	4.00
MARYLAND 205 North 9th St.	2.50	3.50–4.00	4.00–4.50
MAYFAIR 8th and St. Charles St.	3.00	4.50–5.00–5.50 6.00–6.50–7.00	5.50–6.50
MELBOURNE 3601 Lindell Blvd.	2.50–3.00–3.50–4.00	4.00–4.50–5.00 6.00	4.50–5.00–6.00 7.00
PARKEDGE 4907 W. Pine Blvd.		4.50	6.00
PARK PLAZA 220 N. Kingshighway Blvd.		5.00	6.00
ROOSEVELT 4901 Delmar Blvd.		3.00 (shower only)	
STATLER 9th and Washington Blvd.	2.50–3.00–3.50–4.00 4.50–5.00 Parlor (wall bed), 7.00 single; 9.00 double Parlor suites (2 or 4), 15.00–22.00	4.50–5.00–6.00 6.50–7.00	5.00–6.00–6.50 7.00–8.00–9.00
WARWICK 1428 Locust St.	2.00–2.50–3.00	3.50–4.00–4.50 5.00	4.00–5.00–6.00
YORK 8 South 6th St.	2.00–2.50	3.50–4.00	4.50

BUREAU OF PUBLIC RELATIONS

DENTAL HEALTH EDUCATION FOR AMERICAN YOUTH

By HARRIET FITZGERALD,* A.B., Berkeley, Calif.

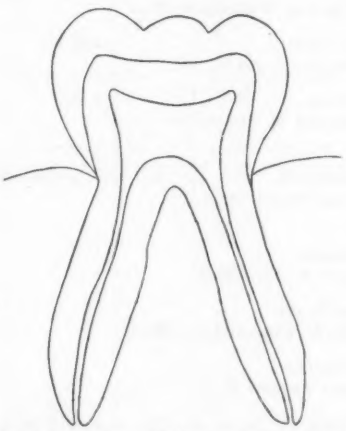
DR. C. Willard Camalier's article in the October issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION AND THE DENTAL COSMOS, entitled "Dental Health for American Youth" offers a challenge to every dentist and dental hygienist in the United States.

The reading and studying of this article has led me to present for publication an original lesson which might aid in educating the 30,000,000 school children in the United States. It is based on the well-established fact that early operative dentistry and education will prevent serious dental defects. The plan is one which could be used by any one interested in teaching children the importance of early dental care. It has been used successfully in the Berkeley Public Schools and is considered by the teaching staff one of the best types of health educational material. If every dentist and dental hygienist would educate American youth to recognize the value of dental health in terms of what is now known and what the loss of it will mean in later life from a physical, economic and social standpoint, American youth might attain dental health.

How could such a plan be inaugurated? Through education. The public school is the chief remedy for the ills of society and it is through the schools that we must educate youth.

*Dental hygienist, Berkeley Public Schools; instructor in dental hygiene, University of California.

Over twenty years ago, Dr. Alfred C. Fones and several other dentists conceived the idea that since the dental profession had not succeeded in teaching the preventive measures that were then well known, the dental hygienist should do that service through a practical system of mouth sanitation and a program of public education.



Outline drawing of first permanent molar, used in lesson on dental anatomy and tooth decay.

That dental hygienists have not achieved the goal set up for them twenty years ago is obvious. In the first place, not all dentists have agreed that the members of this allied profession should be trained and licensed. To date, only

Lesson on Dental Anatomy and Tooth Decay

Lesson suitable for grades 4-9.

Materials needed:

1. Crayons, red and yellow.
2. Mimeographed sheets with outline of first permanent molar. (See accompanying illustration.)
3. Pencils.

Instruction technic:

A. The mimeographed sheet is given out and the children write the following sentences on the back of the mimeographed sheet.
   1. This is a cross-section of a lower sixth year molar.
   2. The sixth year molar is a permanent tooth.
   3. I should have four sixth year molars.

B. The paper is then turned over and the following instructions are given.
   1. Color the pulp, commonly called the nerve, red (center section).
   2. Color the dentin yellow (the part next to the pulp, which is in the center).
   3. The outside covering, the enamel, is not colored and remains white.
   4. Color the gums light red.
   5. Label each part with pencil including the roots, gums, enamel, dentin and pulp. An arrow should point to each.

C. After the labeling is completed, the child is instructed to put narrow light red lines from the pulp to the dentin and is told that these lines represent nerves.

Discussion technic:

A. Some cavities can be filled with little or no pain. This is because the cavity is very small and is only in the enamel.

B. If there is pain while the dentist is filling the tooth, the dentin has been penetrated by the decay, the effect on small nerves in the dentin causing the sensation.

C. When cavities are painful as soon as the dentist touches the tooth, the cavity has entered the dentin. Before the dental visit, there may have been sensation when something hot or cold or sweet was eaten.

D. When the tooth aches and the face swells, the decay has probably reached the pulp. If it has, the pulp will die and the tooth become abscessed. Extraction is usually the end-result.

E. This entire process of decay extending to the pulp can be prevented by the detection of small pit cavities through regular periodic examination by a good dentist or dental hygienist, and the filling of these cavities while they are in the enamel only.

F. In addition to regular dental care, factors in good dental health include adequate nutrition and mouth hygiene.

Note: If possible, a dental examination by a dentist or a dental hygienist should be made prior to this lesson. At the conclusion of the lesson, the names of those who have good teeth are read aloud to the class and they write on their mimeographed sheet:

My sixth year molars are good.

Those children with defects in the first permanent molars write:

My sixth year molar has a cavity.

The dental hygienist or dentist then outlines the cavity in pencil and the child is instructed to color it brown and label it cavity.

Discussion: A small cavity in the enamel does not hurt and the child does not know it is there until the dental examiner tells him. A larger cavity can be felt with the tongue. A still larger cavity hurts when the child eats hot, cold or sweet foods.

Comment: This type of lesson usually results in dental corrections being made. The child should be required to take the mimeographed sheet home with him.

twenty-nine states, the District of Columbia and Hawaii license dental hygienists, and there are only eighteen training schools for hygienists in the United States. The second reason that more progress has not been made by this profession is the fact that training schools have recognized only the first part of the original plan, training in a practical system of mouth hygiene, and have not emphasized the program of public education. In the third place, the majority of training schools have not kept pace with modern trends in education; and, lastly, school administrators have not been convinced that dental health education is an important part of the health program because dentists and dental hygienists have not recognized educational principles or practices. Many have not availed themselves of modern methods of teaching or conducting a public health program. It is with this in mind that the accompanying lesson for dental health education is presented. It is only one of a series of lessons which have possibilities for teaching dental hygiene to school children. It can be used by dentists and dental hygienists engaged in school work.

There is no one easy road to the teaching of dental health. Lessons used successfully by one person may not have the same effect when presented by another. However, if dental lessons are in accord with modern educational methods, they meet the school standards.

PROGRESS OF THE ORAL HEALTH PROGRAM IN THE SCHOOLS OF KANSAS

By Leon R. Kramer,* D.D.S., Topeka, Kan.

SET-UP OF SCHOOL PROGRAM

The Oral Hygiene and School Inspection Committee of the Kansas State Board of Health is composed of three members of the Kansas State Dental Association, fourteen district chairmen and 104 county chairmen. The officers of the Kansas State Dental Association and the committee on oral hygiene act as an advisory board to the Division of Dental Hygiene of the Kansas State Board of Health. Dental inspections are made by the practicing dentists of the state under the correlated direction of the director of the division of dental hygiene and the district and county chairmen, who are appointed by the district officers of the Kansas State Dental Association. All corrective, promotional and special activities, such as the current poster contest, are also carried on through the above-mentioned channels. Classroom oral health programs, the follow-up program and the check-up of children of indigent families for clinical services are delegated to the public health nurses and teachers. In cities and counties that have a health department, or county unit, the activities of the state department, the local health department and the dental and teaching professions are synchronized and unified.

DENTAL INSPECTION

By the end of the school year 1937-1938, approximately 200,000 Kansas school children will have been examined by practicing dentists of the state. In cities and counties that have had no program prior to this year, from 70 to 85 per cent of the children are reported to

*Director of the Division of Dental Hygiene, Kansas State Board of Health.

have dental defects. In schools where the program has been carried on for several years, this figure has been reduced to 56 per cent. Counties that promoted the program last year and again this year find that the number of children having dental defects has been reduced from 19 to 25 per cent. In schools that have promoted intensive programs, the percentage of defective mouths has been reduced as much as 46 per cent. There are several large schools and many small ones in Kansas that will approximate 100 per cent corrections before the end of the school year. The Kansas State Board of Health supplies examination forms free of charge.

PROPHYLAXIS PROGRAM

The dental division of the state board of health supplies all teachers and nurses with the booklet "Dentistry and Public Health" for use as a text in the promotion of school oral health programs. They, in turn, teach oral hygiene in correlation with social and health studies. Four dental films are made available to the visual education departments of the various schools. These films have been shown to more than 20,000 school children, members of civic clubs and P.-T. A. groups in the last four months. A teaching unit is now being prepared specifically for the oral health program. Slides, lectures, radio talks, news releases and mimic broadcasts are also supplied by the division of dental hygiene.

CORRECTIVE PROGRAM

Many of the larger cities, such as Hutchinson, Wichita, Kansas City, Salina, Lawrence and Topeka, have full-time or part-time dentists in the school dental clinic or in the city health department. In other cities, such as Arkansas City, Manhattan, Atchison, Beloit, Clay Center and Abilene, the school board has made arrangements with the local dental societies to take care of underprivileged children on an hourly basis. Some of the larger counties have a dentist in the clinical set-up under the poor commissioner. Others have made a special study of the indigent children problem and have set aside a sum for corrective work at a flat rate per unit of service. In one locality, members of the dental society have, as a charity project, set aside for the correction of dental defects in the indigent children in their city and vicinity, the Thursday afternoons that they usually take off. The commissioners in most counties provide for emergency service. The Red Cross has aided in many counties by appropriating from $150 to $800 per county for dental corrections, either on an hourly or on a unit of service basis.

The number of children in the indigent and marginal groups in different parts of the state varies from 16 to 22 per cent, according to information received thus far. The main object of the oral health program, however, is educational. We hope to teach the child and his parent, by conducting an annual dental inspection and by teaching oral health in the schools, that the immediate correction of small defects will keep the cost of dental service within easy reach of the average pocketbook. With one hundred children as a basis, the average child develops less than one new cavity per year. This places the cost of dental care per year within the financial range of more than 80 per cent of the people in our state. Data collected in this division from the various localities reveal the fact that the lowest percentage of children who have ever received dental corrections is 50 and the highest 92. "To graduate every child from our elementary and high schools with no missing teeth and a healthy mouth" is the goal of the oral health program in Kansas.

TULSA, OKLAHOMA DENTAL HEALTH WEEK

To the Tulsa County Dental Society goes the credit for initiating the idea of "Dental Health Week," which was observed in Tulsa during the week of the thirty-first annual session of the Oklahoma State Dental Society, held during the third week in April.

In response to a petition from the Tulsa District Dental Society, Tulsa's mayor Dr. T. A. Penney, issued the following proclamation:

DENTAL HEALTH WEEK:
PROCLAMATION

WHEREAS, The Oklahoma State Dental Society will again honor Tulsa for its second consecutive year by holding its annual session in this City April 17 to 20, 1938, and will thereby bring to Tulsa visitors and citizens from neighboring commonwealths as well as several hundred members from within our State; and

WHEREAS, the Oklahoma State Dental Society, the Northern District Dental Society and the Tulsa County Dental Society have brought honor, attention and acclaim to this part of the great Southwest through their efforts directed toward the immunization and prevention of dental disease as a prevalent cause of human illness; and

WHEREAS, such societies have advocated a program of education toward the use of proper diet and proper care of teeth, to prevent dangerous food infection as a health service: be it

Proclaimed, that the week of April 17 to 23, 1938, is Dental Health Week and all schools, colleges, universities, chambers of commerce, civic groups and all organizations cooperate by observing this week by and through the use of programs devoted to the recognition of the work being done by dental societies; and that speakers be engaged at luncheons, meetings and assemblies, such speakers being available through the Tulsa County Dental Society. Call 4-2672 or 5-3663. Exhibits may be procured by calling 4-5450.

Witness my hand and the seal of the City of Tulsa, Okla., this 25th day of February, 1938.

T. A. PENNEY, M.D.,
Mayor of the City of Tulsa, Okla.
Attest: Milton W. Davis, city auditor.

NATIONAL DENTAL HEALTH POSTER CONTEST

THE National Dental Health Poster Contest is rapidly drawing to a close. By the time this progress report is presented, most of the component and district contests will have been held and many of the state contests will be well under way.

Reports received from state and component poster chairmen indicate that more than a million children throughout the United States have been reached by this medium and, conservatively, a hundred thousand have made posters. Many of the component societies report that their schools have made 500 to 1,000 posters. One state alone, Missouri, reports between, 3,500 and 4,000 posters.

MINNESOTA

The following letter written by a prize winner in Minnesota indicates what the children themselves think of the contest.

St. Raphael School, Montgomery, Minn.
March 15, 1938

Dr. M. R. Coulter
Mankato, Minn.

Dear Doctor:

Friday, March eleventh, brought added

joy to my life, for it was then I received my Certificate of Award from the National Dental Poster Contest. I want to thank you for sending this certificate and also for any attention you may have given to my poster. I beg leave to assure you of my everlasting gratitude. I remain,

Most respectfully yours,
Miles Kohout.

The ingenious devices employed by many of the poster committees to popularize the contest is gratifying. For instance, E. Harvey Richmond, Chairman of Connecticut, reports that "The Dental Education Committee in charge of the School Poster Campaign in Connecticut is going to follow the plan suggested by Franklin M. Erlenbach, chief of the Division of Mouth Hygiene, State Department of Health. The plan is to have local groups throughout the state exhibit their posters in store windows in the various communities during the first week in May, which seems an admirable way of giving wider recognition of effort to those entering the contests."

The Bureau of Public Relations has mailed to state and component chairmen a series of six publicity releases to be given to local newspapers regarding the contest.

Approximately $3,500 in prizes will be distributed to the various district, state and national winners. In addition to the fifteen silver loving cups and the five sets of the Encyclopedia Britannica given by the American Dental Association as grand prizes, hundreds of prizes, including cash, camping trips, certificates, plaques and books, are being awarded by district, component and state societies.

DETROIT, MICHIGAN EXPOSITION

If one picture is worth 10,000 words, one good exhibit is worth 10,000 more in the opinion of the Detroit dentists. Consequently, the 400,000 visitors at the annual ten-day Detroit, Michigan Exposition, held last January, had an opportunity to look and learn from the 60-foot dental exhibit presented by the Detroit District Dental Society. Orthodontia and plastic surgery models, dental decay and diet and the injurious effects from excessive candy intake told the story of preventive dentistry.

Dental exhibit at the Annual Detroit, Michigan Exposition, January 21-30.

NATIONAL DENTAL INSPECTION CHART FOR SCHOOL CHILDREN

THE American Society for the Promotion of Dentistry for Children, after a comprehensive study of dental programs for children, has approved the accompanying chart for recording findings in group dental inspections of school children. (The Rhobotham Chart, also approved by the society, is to be used for more detailed studies and correlations. The National Dental Inspection Chart is a basic one used to determine the dental needs of children.)

It is a modified form of the chart designed and used by the United States Public Health Service and the American Dental Association in the 1933-1934 dental survey of school children. It is known as the National Dental Inspection Chart for School Children. (See page 819.)

In recommending this chart, the Committee on School Dental Programs for Children of the American Society of Promotion of Dentistry for Children pointed out that:

1. A nationally accepted chart will help to bring order out of present day dental inspection chaos.

2. The National Dental Inspection Chart, when properly filled out, will furnish the essential information for a survey of dental needs of school children from 6 to 14 years of age.

3. The adoption of this form will afford communities the opportunity of evaluating dental programs with uniformity.

4. Other items may be added to this basic chart if desired and additional subdivisions may be used.

5. By compiling the data as was done in the United States Public Health Survey,[1] trends in dental health can be studied.

6. The long term advantages accruing from repetitive dental inspections as well as the immediate results in obtaining correction of dental defects impels the committee to urge annual dental inspections as a minimal requirement of dental programs for children. School dental inspections by dentists using mouth mirror and explorer (Walker Type II[2] Method) have educational implications.[3]

This chart has also been approved by the Committee on Dental Education of the American Dental Association. It may be secured from the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, Illinois.

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1. United States Public Health Service Public Health Bulletin No. 226, U. S. Treasury Department, Washington, D. C., May 1936.

2. WALKER, ALFRED: Classification of Examinations for Detection of Dental Caries. *D. Cosmos*, 73:297, March 1930.

3. WILLIAMS, J. F., and SHAW, F. B.: Methods and Materials of Health Education. New York: Thomas Nelson and Sons, 1935, p. 71; PRESCOTT, S. C., and HORWOOD, M. P.: Sedgwick's Principles of Sanitary Science and Public Health. New York: The Macmillan Company, 1935, p. 523; CHENOWETH, L. B., and SELKIRK, THEODORE K.: School Health Problems. New York: F. S. Crofts & Co., 1937, p. 103; THE COMMONWEALTH OF MASSACHUSETTS: Report of the Special Commission to Study and Investigate Public Health Laws and Policies. Boston: Wright & Potter Printing Co., 1936, p. 164.

NATIONAL DENTAL INSPECTION CHART FOR SCHOOL CHILDREN

For dentists using mouth mirror and explorer—Walker Type II. Method

Last Name	First Name	City or County	State

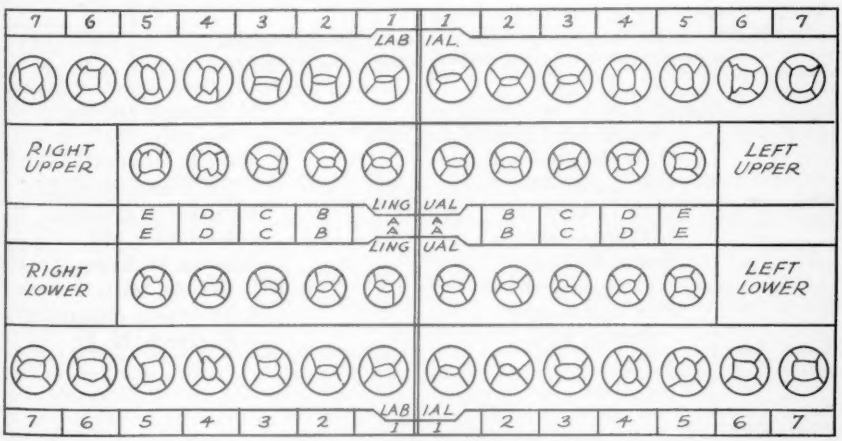
Date	Age	Sex	Color	School	Grade

1. Is dental treatment indicated? Yes..... No.....
2. Has child ever received dental treatment? None.....
   Prophylaxis.....
   Fillings.....
   Extractions.....
3. Number of teeth which have been filled. Deciduous... Permanent...

4. Number of teeth requiring

	Deciduous	Permanent
Removal		
Fillings		

5. Number of missing teeth (Extracted permanent teeth only).....
6. Condition of gums Normal..... Diseased.....
7. Is orthodontic treatment indicated? Yes..... No.....



Approved by the American Dental Association and the American Society for the Promotion of Dentistry for Children.

Distributed by the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, Ill.

For uniformity, data should be compiled as shown in the accompanying tabulation.

COMPILATION OF DATA

Total number of children examined:		YEARS 6-8	9-11	12-14
(a) Present dental needs and oral pathology				
(Percentage)	Treatment needed			
(Percentage)	Prophylaxis needed			
(Percentage)	Gingivitis			
(Percentage)	Caries, deciduous teeth, children with			
(Per 100 children)	Caries, deciduous teeth			
(Percentage)	Caries, permanent teeth, children with			
(Per 100 children)	Caries, permanent teeth			
(Percentage)	Extractions indicated, deciduous teeth, children with			
(Per 100 children)	Extractions indicated, deciduous teeth			
(Percentage)	Extractions indicated, permanent teeth, children with			
(Per 100 children)	Extractions indicated, permanent teeth			
(Percentage)	Malocclusion			
(Percentage)	Orthodontic treatment recommended			
(b) Past dental treatment				
(Percentage)	Treatment received prior to examination			
(Percentage)	Odontexesis, history of			
(Percentage)	Fillings, deciduous and/or permanent teeth, children with			
(Percentage)	Filled deciduous teeth, children with			
(Per 100 children)	Filled deciduous teeth			
(Percentage)	Filled permanent teeth, children with			
(Per 100 children)	Filled permanent teeth			
(Percentage)	Extracted permanent teeth, children with			
(Per 100 children)	Extracted permanent teeth			
(c) Past and present dental needs (evaluation index)				
Percentage of children having either or both: Previously extracted permanent teeth Permanent teeth requiring extraction				
Number of previously extracted permanent teeth plus number of permanent teeth requiring extraction per hundred children				

Committee on School Dental Programs for Children,
O. W. BRANDHORST
St. Louis, Mo.
JOHN C. BRAUER
Atlanta, Ga.
FRANK M. CASTO
Cleveland, Ohio
F. A. DELABARRE
Boston, Mass.
H. SHIRLEY DWYER
Brooklyn, N. Y.
JOHN E. GURLEY
San Francisco, Calif.
RICHARD C. LEONARD
Baltimore, Md.
WALTER MCBRIDE
Detroit, Mich.
J. M. WISAN, *Chairman*
Elizabeth, N. J.

DENTAL ECONOMICS

A STUDY OF DENTAL CARE IN DETROIT, MICH.*

By Rollo H. Britten,† Washington, D. C.

In connection with the National Health Survey,[1] a supplementary schedule was filled out in Detroit in order to obtain data regarding the extent and nature of dental care received in the general population of a large city. The health survey, which depended on house-to-house canvassing for the collection of facts, was devoted to determining the amount and kind of serious illness and chronic disease and the amount of medical care received during the period of one year prior to the date of the canvass in about eighty-four cities and some rural areas in nineteen states. The relation of the data to population and environmental factors was a major consideration.

The supplementary schedule relating to dental care in Detroit, which was filled out in the course of the regular interview with the Detroit families selected, was designed to give information of a character which was not available from the original schedule. The questions on this supplementary schedule covered the following points: (a) when the person last saw a dentist (exclusive of visits for cleaning of teeth only)[2]; (b) the kind of dental service received during the period of one year[3] (extraction, filling, replacement,[4] treatment[5] of gums). The color, occupation and industry of the household head, and the sex and age of the person interviewed were also entered on the schedule.

The house-to-house canvass was made in the winter of 1935-1936, the work ex-

*Digested by the Economics Committee of the American Dental Association; from the Division of Public Health Methods, National Institute of Health.

†Senior statistician, United States Public Health Service.

1. The National Health Inventory, of which the survey was a part, was executed by the U. S. Public Health Service, with the aid of grants from the Works Progress Administration. The project was carried out under the general direction of L. R. Thompson, M.D., director of the National Institute of Health, George St. J. Perrott, project director, and Clark Tibbitts, field director. Others concerned with the technical aspects of the health survey were Selwyn D. Collins, principal statistician, and the author of the report. The dental survey in Detroit was made on request of the Medical and Dental Bureau of Wayne County, O. W. White, D.D.S., chairman, Professional Advisory Committee.

2. The entry was made in years, with fractions for less than 1 year (2/12, 1/52). Thus, there was little chance that an entry meant for a number of years would be taken as meaning a number of months. A special symbol was used for "Never having been to dentist." Throughout this paper dental service reported will be understood to be exclusive of visits for cleaning of teeth only.

3. One or more of these items could be checked for one person, but only one check was possible for a single type of service. The information obtained, therefore, was in regard to the number of persons making one or more visits to the dentist during the year for any one of these types of treatment or for any combination of them.

4. The enumerator was instructed to ask whether any teeth were replaced with plates, bridges or crowns during the year.

5. The enumerator was instructed to ask whether there were any visits to a dentist for treatment of gums or mouth conditions. He was instructed not to include visits for cleaning of teeth only.

tending over a period of about five months. Households were selected on a sampling basis to be representative of those in the city, the group consisting of about 20,000 families.[6] The dental schedule was not added until after the house-to-house canvass had been made of about 1,000 households; but it was not thought necessary to make return visits to secure the dental information from these households, since the remaining 19,000 households were regarded as an entirely adequate sample.

The information was usually given for all persons in a household by a member who was regarded as competent to answer the questions. The enumerators, who were selected from relief rolls, were carefully trained and the work was thoroughly checked. There is every reason to believe that the procedure afforded the degree of accuracy requisite for this type of survey and that the errors in the data are largely those involved in the difficulty one giving the information would have in recalling events of some time before. The questions were simple and could be answered without ambiguity.

The population surveyed, excluding persons under 3 years of age on their last birthday, was 70,554. Because of the method of sampling, this group is regarded as representative of the whole population of Detroit with respect to dental care. Among these persons, about one-third[7] were reported as having been

TABLE 1.—PERCENTAGE OF WHITE PERSONS REPORTED TO HAVE RECEIVED DENTAL CARE (EXCLUSIVE OF EXTRACTIONS ONLY) DURING STUDY YEAR, BY AGE

Age Group	Per Cent	Persons Receiving Care	Population Surveyed
Total*...	22.3	14,808	66,463
3–5.....	7.1	260	3,663
6–8.....	19.7	742	3,772
9–11.....	24.6	966	3,925
12–14.....	26.6	1,087	4,089
15–19.....	31.5	1,976	6,278
20–24.....	30.7	1,832	5,974
25–34.....	28.2	3,369	11,934
35–44.....	21.6	2,685	12,439
45–64.....	14.4	1,699	11,775
65+.....	6.2	146	2,370

*Three years and older; includes unknown age.

TABLE 2.—PERCENTAGE OF WHITE PERSONS (3 YEARS AND OLDER), BY TIME SINCE LAST REPORTED VISIT TO DENTIST

Time Since Last Visit to Dentist	Per Cent		Number
	Simple	Cumulative	
Less than 1 year.	32.8	32.8	21,784
Excluding extractions only	(22.3)	.....	(14,808)
1 year.....	11.1	43.9	7,394
2 years.....	12.0	55.9	7,993
3 years.....	5.6	61.5	3,694
4 years.....	3.2	64.7	2,122
5 years.....	3.9	68.6	2,616
6 years.....	1.9	70.5	1,268
7–9 years.....	2.7	73.2	1,819
10 years and over	6.2	79.4	4,107
Never been to dentist.....	18.5	.....	12,280
Total persons surveyed*..	.....	.....	66,463

*Includes unknown as to whether a dentist was ever seen and unknown time since last visit to dentist.

6. The sample was obtained by an arbitrary division of the census enumeration districts into units having about the same population, every nineteenth unit being completely enumerated.

7. This figure may be compared with that of 24 per cent in the survey in 1928-1931 of the Committee on the Costs of Medical Care (also 3 years of age and over). See "The Incidence of Illness and the Receipt and Cost of Medical Care Among Representative Families: Experiences in Twelve Consecutive Months During 1928-1931" by I. S. Falk, Margaret C. Klem and Nathan Sinai (Publication No. 26 of the Committee on the Costs of Medical Care, 1933).

to a dentist during the year preceding the date of the canvass (referred to in this paper as "study year"). Of these, 11 per cent received no dental service other than the extraction of teeth. In the belief that they frequently represent the treatment of economic necessity rather than the treatment of choice, extractions have not been included in most of the accompanying tables.

The estimates of dental care based on visits to dentists for specified treatment were much lower for the Negro population in Detroit than for the white population. To avoid the confusion of combining the figures for white and colored persons, most of the accompanying tables have been limited to white persons. Certain comparisons by color will be made later in this paper.

As would be expected, the percentage of persons reporting visits to dentists during a year varies greatly with their age. (Table 1.) Among white persons from 3 to 5 years of age, only 7 per cent were reported as having seen a dentist during the year (excluding visits for extractions only). This percentage rose to a maximum of 31 in the age group 15-19 and gradually decreased during adult life, so that for persons over 65 years of age, the percentage was only 6. The comparison suggests that visits to dentists may be related to urgency associated with dental disease, since visits increase up to adult life. It is believed that this is also true of attack by dental caries. Data secured in this survey were not of a character to explain the rapid decline in adult life.

The information received in the survey was not entirely limited to the experience of the year prior to the date of the visit, as one of the questions asked was how long since the person had been to the dentist. For periods of more than year, however, it was not possible to exclude visits for extractions only. Table 2 gives the cumulative percentage of white persons 3 years of age and older against the time since the last reported visit to the dentist. It will be observed from the table that about 65 per cent were reported to have been to the dentist within five years and about 19 per cent as never having been to the dentist.

It is obvious that the proportion of persons who were reported as never hav-

TABLE 3.—PERCENTAGE OF WHITE PERSONS WHO WERE REPORTED AS NEVER HAVING BEEN TO DENTIST, BY AGE

Age Group	Percentage	Number Who Had Never Been to Dentist	Population Surveyed
Total*...	18.5	12,280	66,463
3–5.....	85.0	3,113	3,663
6–8.....	46.4	1,751	3,772
9–11.....	26.7	1,047	3,925
12–14.....	22.7	929	4,089
15–19.....	16.6	1,041	6,278
20–24.....	11.6	694	5,974
25–34.....	8.2	977	11,934
35–44.....	8.9	1,107	12,439
45–64.....	10.7	1,262	11,775
65+.....	12.4	295	2,370

*Three years and older; includes unknown age.

TABLE 4.—PERCENTAGE OF WHITE PERSONS (3 YEARS AND OLDER) REPORTED TO HAVE RECEIVED DENTAL CARE (EXCLUSIVE OF EXTRACTIONS ONLY) DURING STUDY YEAR; BY SOCIO-ECONOMIC CLASS OF HOUSEHOLD HEAD

Socio-Economic Class of Household Head	Per Cent	Persons Receiving Care	Population Surveyed
Professional persons	42.5	1,158	2,726
Dealers, etc.....	30.0	2,123	7,069
Clerks, etc.....	30.6	2,682	8,757
Skilled workmen and foremen.....	20.8	3,676	17,698
Semiskilled workers	17.2	3,313	19,245
Unskilled workers..	16.3	1,416	8,690
Servants.....	18.3	313	1,714

ing been to a dentist will be especially affected by the factor of age. In Table 3, accordingly, this percentage is given for specific age groups. It varies from a maximum of 85 per cent for persons in the age group 3-5 years to a minimum of 8 per cent for persons in the age group 25-34 years. The slight increase in the percentages for persons of more advanced age is probably due partly to the question of memory and partly to an increase in amount of dental care at the present time.

Occupations of a household head were grouped on the basis of socio-economic class as follows: (a) professional persons; (b) wholesale and retail dealers and other proprietors, managers and officials; (c) clerks, salesmen and kindred workers; (d) skilled workmen and foremen; (e) semiskilled workers; (f) unskilled workers; (g) servant class.

Table 4 shows, for each of these socio-economic classes, the percentage of white persons, 3 years of age and over, who were reported to have received dental care (exclusive of extractions only) during the period of one year prior to the date of the visit. Although the percentage in families of which the head was a professional person is 42, it falls as low as 16 for families of which the head was an unskilled worker.

The survey followed a period of intense depression during which dental care was probably neglected in a large part of the population. At the time of the canvass, the degree of recovery in Detroit leads one to expect that many persons would be making long postponed calls to dentists. It is reasonable to assume, therefore, that the figures shown in this analysis, especially for certain groups of the population, are somewhat in excess of what would be found during a normal period. For this reason, the differences for families on various socio-economic levels may not be so great as they would be in a normal period.

Table 5, giving the proportion of adults reported as never having been to a den-

TABLE 5.—PERCENTAGE OF WHITE PERSONS (20 YEARS AND OLDER) WHO WERE REPORTED AS NEVER HAVING BEEN TO DENTIST; BY SOCIO-ECONOMIC CLASS OF HOUSEHOLD HEAD

Socio-Economic Class of Household Head	Per Cent	Number Who Never Had Been to Dentist	Population Surveyed
Professional persons	4.4	87	1,966
Dealers, etc.	7.2	349	4,842
Clerks, etc.	6.2	384	6,192
Skilled workmen	9.5	1,090	11,506
Semiskilled workers	10.5	1,323	12,594
Unskilled workers	16.3	946	5,787
Servants	10.5	128	1,222

TABLE 6.—PERCENTAGE OF PERSONS REPORTED TO HAVE RECEIVED DENTAL CARE (EXCLUSIVE OF EXTRACTIONS ONLY) DURING STUDY YEAR, BY COLOR, IN TWO BROAD AGE GROUPS

	Total*	3 to 19 Years	20 Years and Older
Per Cent:			
White:			
Professional	42.5	44.7	41.8
Total	22.3	23.2	21.9
Colored	8.4	10.2	7.5
Persons receiving care:			
White:			
Professional	1,158	335	822
Total	14,808	5,031	9,731
Colored	343	135	206
Population surveyed:			
White:			
Professional	2,726	750	1,966
Total	66,463	21,727	44,492
Colored	4,091	1,319	2,738

*Three years and older; includes unknown age.

tist, by socio-economic class of the household head, shows a very great contrast between the professional and other groups, the proportion being four times as great for the unskilled as for the professional.

The colored population may perhaps most easily be regarded as forming an additional socio-economic class. In Table 6, therefore, the percentage of persons reported to have received dental care (exclusive of extractions only) during the year preceding the date of the visit is shown for the professional white group, for the total white group and for the colored group. The very great contrast between the white and colored population is evident. Five times as many individuals in households of professional persons (white) were reported to have received dental care (exclusive of extractions) as in the colored population.[8]

TABLE 7.—PERCENTAGE OF WHITE PERSONS (3 YEARS AND OLDER) WHO WERE REPORTED TO HAVE RECEIVED DENTAL CARE DURING STUDY YEAR, BY TYPE OF TREATMENT

Type of Treatment	Per Cent	Number
Any care	32.7	21,784
Filling only	11.2	7,466
Filling, replacement, and extraction	0.5	361
Filling and extraction	4.1	2,727
Replacement only	1.1	733
Replacement and extraction	0.9	606
Treatment of gums only	0.6	397
Extraction only	10.5	6,976
Other combinations of above	1.4	916
Totals:		
Filling	16.9	11,242
Replacement	3.3	2,163
Extraction	16.7	11,103
Treatment of gums	1.6	1,081
Other treatment	0.1	74
Unknown as to nature	2.0	1,342
Any, exclusive of extractions only	22.3	14,808
Persons surveyed	.....	66,463

Up to this point, the percentages have not been given separately for the two sexes. The differences are not sufficiently great to affect any of the comparisons which have been made, but it is of interest to note that a slightly higher proportion of women appear to have received dental care, which may be associated with greater need.

It has been brought out that 33 per cent of white persons were reported to have received dental care during the year before the date of the visit. Eleven per cent of these made their visits for extractions only, 11 per cent for fillings only and 4 per cent for fillings and extractions. Table 7 indicates the percentage of persons reported to have made visits for different types of treatment.[9] Various combinations are shown and also the percentage of persons who made visits for any one kind of treatment, regardless of whether they also made visits for some other kind of treatment.

It will be noted that considerable difference exists in the relative incidence of the various types of treatment at different ages.

SUMMARY

As a part of the National Health Inventory, a supplementary schedule was utilized in one city (Detroit, Mich.) to determine the amount and kind of dental care received by a representative sample

8. In this comparison, no allowance can be made for possible differences in the need for dental care among white and colored persons. In view of the fact that the incidence of dental caries is known to be lower in the colored race, it is clear that the need for that part of dental care associated with dental caries must be lower for colored persons.

9. The fact that only 2.0 per cent were recorded as having been to a dentist, with no information as to the nature of the treatment, increases confidence in the data covering the percentage of persons who were reported as having seen the dentist within one year.

of the population (70,554 persons 3 years of age and over being surveyed). Information was secured by house-to-house canvass as to when the person had last seen a dentist and the type of treatment received in the year before the date of the canvass. Visits for cleaning of teeth only were excluded. The items were related to the age and sex of the persons and the color and socio-economic class of the household head. The following facts (based on white persons 3 years of age and over except where otherwise specified) stood out:

1. Thirty-three per cent (22 per cent if visits for extractions only are excluded) were reported to have seen the dentist in the year before the date of the canvass.

2. The differences with age were marked, varying from 7 per cent (excluding visits for extraction only) in the age group 3 to 5 years to 31 per cent in the age group 15 to 19 years, and dropping to 6 per cent in the age group 65 years and over.

3. The proportion who had never seen a dentist varied from 85 per cent in the age group 3 to 5 years to 8 per cent in the age group 25 to 34 years, being 19 per cent for the whole group.

4. The percentage of persons reported as having seen a dentist in the year before the date of the canvass (exclusive of visits for extractions only) varied greatly with the socio-economic class of the household head (from 42 per cent for professional to 16 per cent for unskilled workers). For colored persons, the figure was 8 per cent.

5. The dental care received during the year before the date of the canvass was largely for extraction and/or filling, with characteristic differences by age,

6. Extractions showed slightly higher percentages in the lower socio-economic groups. All other types of treatment showed the reverse, especially fillings (about three times as much in professional as in unskilled). An even greater difference was evident in comparing persons in white professional families with the colored population.

A STUDY OF DENTAL INCOMES

The U. S. Department of Commerce, in making a study of National incomes, is including a survey of dental incomes. April 8, 1938, the National Income Section of the Department of Commerce mailed questionnaires to every member of the American Dental Association. As rapidly as possible, the same questionnaire will be sent to non-association members. Information is desired on gross and net income, cost of conducting independent practice, salaried income from professional services, age, collegiate education, type of specialized practice, etc.

The Economic Committee of the American Dental Association is most desirous of securing the data compiled from the answers to these questionnaires and requests the cooperation of all our members.

Fill out the questionnaire as soon as you receive it and return it to the Department of Commerce. Do not sign your name as the identity of individuals is of no importance.

LON W. MORREY,
Committee on Economics.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Use of Toothbrush—If we could lead our patients to be as much concerned about the proper and thorough use of the toothbrush as they are about the correct brand of tooth paste and powder, we would see a greatly improved condition of the oral tissues.

It is a good plan to advise patients to have three brushes with different colored handles and keep them in a drinking glass so they can be placed in the bathroom window where sunshine can revitalize the bristles and diminish growth of bacteria; for instance, using a red handle for morning, a white handle for noon and a black one for night, and procuring new brushes at least every six weeks.—*Rowe Smith, Texarkana, Texas.*

Rugae—Irregular ridges in the mucous membrane of the mouth covering the hard palate not only assist in the various functions of the mouth, such as triturating the saliva and food and thus aiding digestion, but also are an aid in deglutination and vocalization. Every denture covering the hard palate should be equipped with rugae.—*Calvin William Knowles, 177 Post Street, San Francisco, Calif.*

Tarnish in Alloys—The tarnish resistance of alloys for mouth use can be very easily tested as follows: Heat in a porcelain evaporating dish about 30 cc. of liquid petrolatum or any lubricating oil. Dissolve in the oil a minute amount of sulphur, little enough so that it will all go into solution in the hot oil, and there will be none to remain on the bottom of the dish and obscure the results of the test. Place in the oil as controls a small piece of bright copper and one of silver. Also place in the oil the alloy to be tested, polished in at least a few places. A piece of pure gold can also be immersed for comparison. Heat the oil until the copper and silver turn quite black from the formation of sulfides. Whatever color the alloy becomes in the oil, it will very probably become in the mouth.—*Alfred T. King, Cicero, Ill.*

Converting Old "Dentocoll" Trays to Water-Cooled Trays—Dentists who have old "dentocoll" trays and have discarded them in favor of the new water-cooled trays or are employing the first technic used when dentocoll was placed on the market can now convert them into water-cooled trays at a very low cost. Any auto parts store can supply copper tubing one-sixteenth inch in width that is very soft and can be bent and contoured by hand to fit in the tray, and soldered with the soft rosin core solder and a soldering iron; price, 30 cents, complete. Two holes are made in the front of the tray large enough to allow the copper tubing to pass through easily. It is soldered at the heels of the tray, in the middle and in the front where it extends through the hole about one-half inch. Over this part, a piece of copper tubing three-quarters inch long and of one-quarter inch gage is fitted, a very tight union resulting. It may be necessary to file the one-sixteenth

inch tubing to fit more securely within the one-quarter inch piece. When the parts are soldered, and the solder finished smooth with a file, we have a water-cooled tray that will compare with the best on the market.—*H. I. Ehrenkranz, Dupont, Pa.*

Silicate Fillings—This class of fillings, commonly spoken of as synthetic porcelain fillings, are much criticized by certain dentists because it is an accepted fact that this material is not so resistant to chemical action and mechanical force as the metal fillings. However, statements are seen relative to the silicates in the dental journals which do this material as a class a great injustice; such as, "They develop brown margins," "They will not last more than two or three years," "They discolor in the mouth," and "They dissolve out." All of these faults are the result of incorrect manipulation of the material in timing the mixing and building the filling. Dentists having such results, except on rare occasions, have not learned the art of making these fillings, which is really simple and as yet is not given by the manufacturers. Thousands of these fillings made in the University of Nebraska dental clinic and several thousand placed in private practice have in most cases lasted from five to twenty-five years and are still in place, seemingly without change. Many of these were put in the teeth of patients who are now dentists in Nebraska and are now using silicate fillings in their practice. They are the same color as when put in and they have no discolored margins. The pulps are still vital. The fillings show little or no dissolution and the teeth show no decay about them. For these reasons many fine silicate workers in Nebraska seldom use any other material for Class III and Class V cavities in the anterior teeth.—*W. Clyde Davis, Lincoln, Nebr.*

INCIDENTS OF PRACTICE

Acute Lymphatic Leukemia: Report of a Case*

By Franz Wilhelm Stumpf,† D.D.S., and Dan Wooldridge Daggett, D.D.S., A.B., San Antonio, Texas

A. L., a Mexican boy, aged 7 years, of normal height, slightly underweight, consulted one of us (D.W.D.), June 26, 1937, in Robert B. Green Memorial Hospital Dental Clinic for extraction of the lower deciduous central incisor teeth. These teeth were loose and there was marked hemorrhage from the gingival crevice.

Further examination of the patient showed the upper lip to be enlarged, seemingly edematous, and with discoloration from petechial hemorrhage of the submucous tissue. There was a slight enlargement of the submaxillary lymph glands, the cervical chain showing less involvement. The boy was pale and a condition of general malaise was evident. The temperature was 102. There was a recent scar on the left side of the face immediately below the supra-orbital crest with discoloration of the left orbital area. Questioning revealed that a biopsy specimen had been taken from a tumor mass in the area, the diagnosis being retinoblastoma. This condition had subsequently been treated with x-ray therapy and the tumor mass was gradually reduced in size until it was hardly noticeable.

The history of the patient revealed that he was subject to frequent hemorrhage from the nose and the gingivae, fever and anorexia, followed by loss of weight and strength. The resistance of the patient was markedly low as

(Read at the regular monthly meeting of the Robert B. Green Memorial Hospital, San Antonio, Texas, December 13, 1937.)

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†Chief of the Section on Oral Surgery, Robert B. Green Memorial Hospital.

was indicated by the fact that slight scratches did not heal readily but developed into exuding sores, there being three present at the time of examination. One sore was located in the cubital fossa of the left arm, one on the dorsum of the left wrist and the third on the side of the right ankle.

The findings in a differential blood count and a urinalysis are given in Table 1.

A working diagnosis of acute lymphatic leukemia was established from the blood picture and clinical history. The teeth were not removed. Medical consultation was had.

The patient was hospitalized. Liver extract and ammonium citrate with iron were administered and the bowels were kept open with soapsuds enemas at frequent intervals.

Acute leukemia occurs most frequently during the first five years of life and becomes more rare as age advances. The true condition of acute lymphatic leukemia may be mistaken for purpura hemorrhagica; which makes the diagnosis more complex. In this patient, there were no signs of a true purpura hemorrhagica.

This disease has a very characteristic syndrome and progresses rapidly to death. One of its distinguishing characteristics is the proliferation of the blood cells.

The results of the clinical examination are sometimes variable, and because of this, a definite diagnosis cannot be made without a study of the blood cells. Frequently, a hemorrhagic diathesis is aggravated and the peripheral lymph nodes are not swollen.

According to the literature, authorities fail to ascribe any definite etiology to acute lymphatic leukemia. The disease predominates in males in a ratio of two to one. Unfortunately, any conditions possibly predisposing to the disease are unknown.

The symptoms of acute lymphatic leukemia at the onset are acute and often are preceded by an acute infection, such as tonsillitis, or by the presence of an abscessed tooth. As is typical of an infection, the onset has the characteristic symptoms of elevated temperature, headache or prostration. Pallor of the skin and gland involvement are usually present in this disease. One striking symptom simulating acute lymphatic leukemia is the formation of nodular tumors on the skull, pelvis or rib, protrusion of the eyes and paralysis of the facial nerve.

TABLE 1.—BLOOD COUNT AND URINALYSIS

Blood Count		Urine	
Red blood cells	990,000	Reaction	Neutral
White blood cells	35,800	Specific gravity	1.002
Stabs	1	Albumin	Negative
Segmented forms	4	Sugar	Negative
Neutrophils (total)	5	Casts	Amorphous
Lymphocytes	88		
Monocytes	7		

TABLE 2.—ROUTINE BLOOD COUNTS

Red blood cells	990,000	900,000	690,000	570,000
White blood cells	35,800	32,400	29,100	26,500
Myelocytes	0	0	0	1
Juvenile cells	0	0	4	3
Stabs	1	6	2	6
Segmented forms	4	4		3
Neutrophils (total)	5	10	6	13
Lymphocytes	88	90	94	81
Monocytes	7	—	—	6

The treatment of acute lymphatic leukemia, as with any acute infection, is symptomatic.

Since the prognosis for acute lymphatic leukemia is not favorable, transfusions were given at intervals, and routine blood counts were made. Results of these counts are given in Table 2.

Because the red cell count fell rapidly below 1,000,000 per cubic centimeter of blood, and the hemoglobin less rapidly, the diagnosis of true acute leukemia was assured.

Clyses of normal saline solution with glucose were administered. The patient's condition became critical. The swelling of the upper lip increased. Food and medication by mouth were refused. There was a purulent discharge from the left ear. July 7, the patient became delirious and, with hemorrhages from the nose and ears, died at 4:50 a. m.

A review of the literature on the subject prompted a final diagnosis of acute lymphatic leukemia, which has been defined as an "unusual form of leukemia characterized by the occurrence of localized tumors in relation particularly to the periosteum and ligamentous structures of the skull, paranasal sinuses, orbits, spine, ribs and sacrum."

This case is reported because the patient came to the dental section for attention and the treatment was made through the department of medicine.

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602 Augusta Street.

Hereditary Aplasia of the Enamel

By J. J. OLSON, B.S., D.D.S., Toledo, Ohio

As an introduction to this case, one of rare and perplexing dental deformity, an attempt will be made to find a suitable nomenclature. Because of the rarity of the condition and a lack of literature describing cases, the most logical term to apply to it at present is hereditary aplasia of the enamel.

D. B. Freeman records a case in a person of 26 years whose teeth anterior to the second molars were entirely devoid of enamel. The condition appeared in both brothers and sisters and could be traced back three generations.

G. V. Black described the teeth of a man aged 27 having enamel of an opaque, paper-white appearance, as easily cut as a slate pencil, and with dentin of ordinary consistency. The teeth presented little caries. He also described the deciduous teeth of a child without a trace of enamel and with the dentin soft, pliable in any direction, very sensitive and penetrable with an explorer. This he called agenesia of the enamel.

Fig. 1.—Case as presented.

Fig. 2.—Case as restored with porcelain jacket crowns.

REPORT OF CASE

About six months ago, a young man, aged 20, presented himself for dental reconstruction. Clinical examinations disclosed the following conditions:

1. Enamel on the twenty-eight erupted teeth totally absent.
2. Crowns about normal size, with allowance for the lack of enamel.
3. Superficial tissues normal; no lesions present.
4. Crowns presenting a straw-colored tobacco stained appearance.
5. Contact missing.

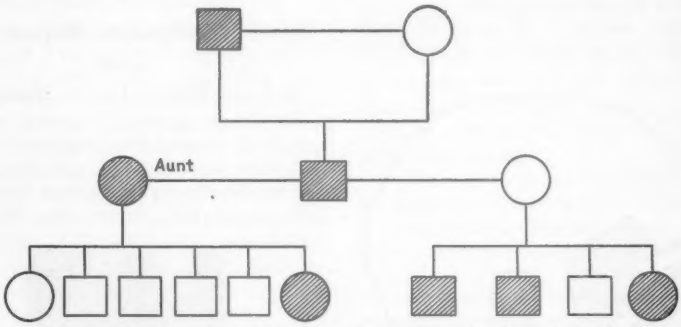


Fig. 3.—Heredity chart, indicating the condition in three generations.

6. Considerable caries, but no involvement of pulps.
7. All teeth vital.
8. Sensitiveness only to extreme heat and cold.
9. No history of pain, Nature having, in her manner, compensated to protect the pulps from thermal and mechanical shock.

X-ray examinations revealed:

1. Normal pulp chambers.
2. Normal bony structure.
3. Extensive caries in bicuspids and molars.
4. Unerupted third molars with enamel.

The youth, good oral health and cooperation of the patient were the deciding factors for reconstruction of the "dental cripple," with porcelain jackets on the bicuspid and anterior teeth, and gold cast crowns on the molars.

For the operative procedure, I combined nerve block anesthesia with nitrous oxide analgesia, to reduce shock from the ordeal of grinding.

According to the patient, the same conditions could be traced back at least three generations.

The importance of photographs cannot be overemphasized. They tell the story in a simple manner. As a record of before and after completion of the case, there can be no doubt of their value to patient and operator. An inexpensive camera and equipment affords such records and something tangible to file away for future reference. These references prove to be a more convincing demonstration to the laymen than a mere description.

400 Richardson Building.

Ischemia of the Face Following Injection into the Pterygopalatine Canal: Report of Case

By Robert B. Mowry, D.D.S., Pittsburgh, Pa.

A boy, aged 10, applied to a public school dispensary for extraction of the upper left deciduous molars. Injection of 1.5 cc. of a 2 per cent procaine solution with epinephrine 1:50,000 was made into the pterygopalatine canal according to the method described by Gillam.[1] A Luer syringe, with stainless steel needle 1 inch long from safety hub to point and of 25 gage, was used.

A preliminary injection of a few drops of the solution was given to anesthetize the palatine nerves. The needle was then passed into the canal and advanced about three-quarters inch. At this point, the patient experienced a sharp pain, lasting but a few seconds. Injection was continued, about 1 cc. being deposited at the depth of 1 inch.

1. Gillam, C. G.: Palatal Second Division Block. *D. Survey*, 13:871, July 1937.

Symptoms of anesthesia appeared rapidly. In two or three minutes, definite areas of blanching appeared on the skin of the face, clearly defined and including the ala of the nose, the infra-orbital region, the left half of the upper lip, the temple nearly to the auricle and a portion of the supra-orbital region. The remainder of the skin of the left side of the face appeared to be flushed, but this may have been due to the contrast in color.

Anesthesia seemed to be profound, especially in the region of the floor of the orbital cavity. The patient rubbed his eye and complained of numbness in that region. This condition lasted about forty minutes and then passed away rapidly. The teeth were extracted with little discomfort although the operation was postponed until about the time that anesthesia began to fade. At the end of an hour from the time of injection, the patient left the dispensary. He reported no postoperative pain.

Fig. 1.—Area of face affected.

As soon as the blanching was observed, a rough sketch was made of the areas involved, which, on comparison with a diagram in Cunningham's Anatomy, was surprising for accuracy of the outlines of the various areas of distribution of the cutaneous nerves. The affected areas appeared to be: (1) the nasociliary (nasal) branch of the ophthalmic and (2) the infra-orbital, zygomaticotemporal (temporal) and the zygomaticofacial (malar) branches of the maxillary. That the lacrimal area was affected was rather doubtful and the buccinator, mental and auriculotemporal areas of the mandibular branch were unaffected.

It is interesting to note that, apparently, the nasociliary was the only branch of the first division affected. This nerve is the one nearest to the sphenopalatine ganglion.

8 East North Avenue.

Root Resorption: Report of a Case

By Jules Abbott, D.D.S., Walden, N. Y.

The following case is reported because it is not only unusual, but also proved baffling.

A white boy, aged 12, and very healthy, was hit directly on the incisors with a baseball bat, in 1937. At the time, he did not suffer pain of any sort nor any soreness, the only complaint being a feeling of numbness.

Fig. 1.—Roentgenogram showing root resorption.

The boy did not come to the office on account of any trouble with this particular tooth or even with the idea that there might be anything wrong with it, but, on examination of the entire mouth, it was noted that this tooth was very loose, even though there was no gingival disturbance of any kind.

A tooth so loose in a boy of 12 excited interest, and therefore a roentgenogram was taken. As shown in the accompanying illustration, the crown was seen plainly, but no root. An occlusal film also failed to reveal the root. The crown will undoubtedly have to be removed shortly. The tooth is undoubtedly a permanent one, and the root has either been resorbed or has been ejected through the nose in some manner.

Walker Building.

CURRENT LITERATURE

Roentgenographic Method for Successive Examination of an Infinite Number of Parallel Planes of an Object

By B. G. Ziedses Des Plantes

A roentgenographic method is described by which it is possible to examine an infinite number of parallel planes of an object successively. For this purpose, roentgenograms are made of the object from several directions that differ only slightly. By placing these roentgenograms on top of each other in a certain manner and sliding them over each other, one successively sees different planes, coming to stand out definitely.—*Nederl. Tijdschr. v. Geneesk.*, 79:5852, December 21, 1935; abstr. *Am. J. Dis. Child.*, 54:1418, December 1937.

Calcium Metabolism and Teeth

By Isaac Schour

Many important problems arising in the practice of dentistry are related to calcium metabolism. These include the effects of pregnancy on the teeth of the mother, prenatal and postnatal calcification, influence of endocrine glands, the effect of dietary deficiency, mottling of enamel, caries and withdrawal of calcium from the teeth. As the amount of recent research work on these problems has been a little bewildering, Schour's intelligent review of this subject is timely and welcome. His summary follows:

1. It is important to distinguish between the adult tooth, which is essentially completed in formation and calcification and is fully erupted, and the tooth that is still in a growing and formative stage. The biologic reaction of the tooth naturally varies with the different periods of its life span.

2. Present evidence establishes the fact that the adult and fully erupted tooth is as a whole not subject to modification in structure or calcification by changes in calcium metabolism. The calcium content of dentin may be slightly increased with age by secondary calcification. However, unlike bone, enamel and dentin are not storehouses of calcium and are not subject to withdrawal.

3. Present evidence has not established a correlation between calcium metabolism and caries and offers no factual basis for the view that the incidence of caries is increased because of the metabolic changes that occur during pregnancy. Clinical and statistical evidence shows a similar incidence of caries in pregnant women and in other women of corresponding age.

4. The indications are that the response of the growing and calcifying tooth to changes in calcium metabolism induced by endocrine factors and vitamin and other dietary factors is characteristic and to some extent pathognomonic because the calcifying dental tissues are uniquely specialized and sensitive structures.

5. Most of the evidence on the delicate, accurate and prompt response of the calcifying tooth to calcium disturbances is derived from data obtained from animal experimentation, especially on the incisor of the rat, which is a tooth of continuous growth. Nevertheless, recent results of studies on human beings indicate that human teeth are also very sensitive and possess similar kymographic qualities.

6. The kymographic qualities of human teeth facilitate the analysis of the calcification pattern of teeth and constitute the basis for tooth ring analysis as an aid in the assessment of health and disease.

7. The employment of calcium therapy in dentistry *per se* is not justifiable. There is no evidence that alterations in calcium metabolism give rise to oral or dental disturbances without producing other systemic symptoms. When systemic manifestations are present, the responsibility for calcium therapy should rest with the physician.

M. K. Hine.

The Normal Skull, from a Roentgenologic Viewpoint

By C. W. Schwartz

The author describes briefly the skull, giv-

ing its dimensions and classification according to the cephalic index of Retzius. Two good photographs illustrate the anatomic structure. Some anthropologic nomenclature is given, and one photograph shows those bones developed in membrane and those in cartilage. This is followed by five roentgenograms and a discussion of some of the variations of a possible clinical and nonclinical significance. The dental apparatus is not considered.—*Am. J. Roentgenol. & Rad. Therap.* 39:32, 1938.

GRANT VAN HUYSEN.

Roentgenologic and Histologic Investigation of the Teeth and Jaws of New Born Children

By K. U. TOVERUD, K. HAUPL and G. TOVERUD

A ROENTGENOLOGIC study of fifty-four still-born infants, some at full term, some premature, showed that calcification of the deciduous teeth and the first permanent molar is not so far advanced as was formerly believed. The investigators show further that calcification may vary considerably at the same fetal age. Histologic study of thirty jaws from this same material showed extensive osteoid zones and irregular calcification of the dentin, hemorrhage and edema in the odontoblastic layer, the enamel epithelium and the tooth follicle. Changes of this nature and other unhygienic conditions may be associated with pregnancy. The investigations also indicate that a study of "normal" conditions at birth and from the sectioned material must be related to the health of the mother during pregnancy. The importance of prenatal dental prophylaxis is clearly emphasized.—*Norske Tannlaege-Forenings Tidende*, 5-6, 1934.

B. E. LISCHER.

Mixed Tumors of the Parotid Type

By P. L. BOYD

MIXED tumors of the parotid are made up of cells which probably represent embryonic remnants, but their exact origin from embryonic pharyngeal pouches, gill clefts or buccal remnants has not been traced. They do not necessarily bear any relation to the parotid, but are so named because of their usual occurrence in that region. They are not uncommon and they usually appear between 20 and 30 years of age, although they may occur at any age. Their growth is characterized by a slow, steady enlargement. Usually, they are painless, although pressure on a nerve may result in pain. There is a strong tendency to recurrence (from 25 to 30 per cent), but these tumors rarely metastasize and are usually considered benign. Microscopically, epithelial cells of varying character are seen in a connective tissue stroma. The author favors treatment by a combination of operation and irradiation, from 70 to 75 per cent being cured by operation and postoperative radiation bringing the cures up to almost 100 per cent.—*Am. J. Surg.*, 39:641, March 1938.

HAMILTON ROBINSON.

Prenatal Prophylaxis of the Dentin

By G. TOVERUD

A SERIES of investigations on dogs, pregnant women and still-born infants was used as a basis for the study of prophylaxis of pregnancy with special reference to the teeth of offspring. When pregnant dogs were fed a diet deficient in calcium, phosphorus and vitamin A, their descendants showed a deranged chemical formation, and continued use of the diet led to earlier rickets. Pathologically formed teeth are seen when the deficient diet is inaugurated at the beginning of lactation. The mother dogs showed a negative calcium-phosphorus balance when a calcium and phosphorus deficiency existed and the teeth and bones presented a pathologic picture. Metabolic investigation of pregnant women living on the usual low mineral diet showed a negative calcium-phosphorus balance in the last few months of pregnancy. By increasing the calcium and phosphorus in the diet from 1.8 to 2 gm. through addition of 1 liter of rich milk and a tablespoon of liver extract, as well as generous additions of vegetables and fruits, the balance was changed to the positive side. Metabolic investigations of iron and ascorbutic acid content showed a positive balance after increase of these elements in the diet. Roentgenologic, histologic and chemical studies of still-born infants showed an absolute pathologic picture or more or less deviation from the normal when the mother had lived on a deficient diet (mineral and vitamin) during pregnancy or when disease was present during pregnancy. The vita-

min provision for the offspring usually stands in exact relation to the vitamin supply of the mother. The dental changes seen suggest a basis for many defects that appear in the enamel and dentin of deciduous teeth and first permanent molars. Such defects predispose to caries. The congenital osteopathy also shows the very early and marked tendency to jaw deformities. Prenatal care of the mouth is extremely valuable.—*Deutsch. Jugendzahnepfl.*, 25:45, September 1937.

B. E. Lischer.

Studies in Mineral Metabolism with the Aid of Artificial Radioactive Isotopes. I. Absorption, Distribution and Excretion of Phosphorus

By W. E. Cohn and D. M. Greenberg

A study has been made of the distribution and excretion of phosphorus in the rat during the first forty-eight hours after administration, orally or by intraperitoneal injection, of a single dose of sodium phosphate containing radioactive phosphorus. Absorption of the phosphorus is most rapid in the first two hours and is usually at an end eight hours after ingestion. From about 30 to 40 per cent of the ingested phosphorus remains unabsorbed. Of the injected or absorbed phosphorus, from about 20 to 30 per cent is excreted in the urine within eight hours and about 2 per cent is excreted via the large intestines. The tissues which were examined retain the absorbed or injected phosphorus in the following order: bone, muscle, liver, stomach plus small intestine, blood, kidneys, heart, lungs and brain. All except brain show a rapid uptake in the first ten hours, followed by a prolonged, steadily diminishing loss. Brain apparently has a slow turnover of phosphorus.—*J. Biol. Chem.*, 123:185, March 1938.

Marian L. LeFevre.

Analysis of Calcium in Blood and Other Biological Material by Titration with Ceric Sulfate

By C. E. Larson and D. M. Greenberg

A method is presented for determination of calcium in serum (or other liquids) by titration with ceric sulfate. The calcium is precipitated as the oxalate, filtered, washed with 2 per cent ammonium hydroxide saturated with calcium oxalate and dissolved in hot 2 N sulfuric acid. To titrate, 0.01 M ceric sulfate is added and the solution allowed to stand for thirty minutes. The solution is titrated back to a "salmon end-point" with two drops of a neutralized phenanthroline solution. No mention is made of the accuracy of the method.—*J. Biol. Chem.*, 123:199, March 1938.

Marian L. LeFevre.

Familial Ectodermal Defect

By R. T. Brain

The history of a girl, aged 12 years, who at birth was apparently normal, is given. When the deciduous teeth erupted, at 9 months, they were pointed. The maxilla was underdeveloped and the patient had dystrophic nails. The father of the girl had normally shaped teeth, but had one dystrophic finger nail. The mother had no defects. The girl's brother, aged 14, had a dry skin. He was not able to tolerate bedclothes or summer heat. His teeth were also peg-shaped and no permanent teeth were present as shown by the x-rays. His nails were thin and dystrophic. Other children of the family were normal. The condition was diagnosed as anhidrotic ectodermal dysplasia.—*Proc. Roy. Soc. Med.*, December 1937; abstr. *D. Rec.*, 58:88, February 1938.

B. J. Frey.

Stomatitis Venenata

By A. B. Loveman

This article is concerned with a case of sensitivity of the mucous membrane and skin to oil of anise. A stomatitis was noticed in a patient's mouth where the mucous membrane contacted the dentin. When "patch tests" of the dental cream were made, a severe vesicular reaction occurred. When the various ingredients were tested individually, oil of anise was found to be the cause of the trouble. It is suggested that more experimental study be made by means of cutaneous hypersensitivity when similar cases present themselves.—*Arch. Dermat. & Syph.*, 37:70, January 1938.

B. J. Frey.

Disease of the Skin in Negroes

By L. Loewenthal

A portion of the author's communication on fungi and fungous diseases describes some interesting observations on perlèche. The lesion appears at the angles of the mouth and extends to the skin of the cheek and back into

the mucous membrane of the mouth. There are very superficial erosions on the mucous membrane, but they are disguised on the epidermis by white, sodden epithelium of wrinkled appearance. The lesion is painless and is often confused with the mucous patch of secondary syphilis. The predisposing cause of perlèche is thought to be nutritional, with the yeast fungus *Monilia albicans* plus other saprophytes as the exciting factor.—*J. Trop. Med. & Hyg.*, 41:22, January 1938.

B. J. Frey.

A "Bite-Type" Sinus-Mastoid Headrest

By J. M. Neely

The author describes an effective device which can be used in roentgenographic studies of paranasal sinuses and mastoid processes with mobility reduced to a minimum.—*Radiology*, 30:244, February 1938.

B. J. Frey.

Dental Condition in Cleidocranial Dysostosis

By M. A. Rushton

The author reports four cases of cleidocranial dysostosis which came under his clinical care. In these cases, he observed (1) the constant presence of supernumerary teeth as well as unerupted teeth of the normal dentition and (2) the presence of dentigerous cysts in one of his cases. In these cases, all of the supernumerary teeth, with one exception, were anterior to the molar region. The author postulates that, in this condition, the deciduous teeth are not prevented from erupting and that those teeth of the permanent set which erupt first (lower central incisors and first molars) are the least likely to remain unerupted.

Frank Allen.

Acute Hematogenous Osteomyelitis

By D. E. Robertson

The author points out that practically all cases of acute osteomyelitis result from staphylococcal or streptococcal infection. Of the cases of fatal septicemia produced, the streptococcus is responsible for 13.3 per cent and the staphylococcus for 22.4 per cent. The author reports that in streptococcic osteomyelitis, there is no necrosis of bone, and if drainage is carried out and the patient recovers, a sequestrum will not be formed. In staphylococcus osteomyelitis, necrosis of the bone occurs and healing without sequestrum formation is rare. Thus, the case is more liable to become chronic.

The author includes a well-organized discussion of the serologic picture in staphylococcus infection, together with the value of treatment; concluding that: 1. Staphylococcal hematogenous osteomyelitis is a clinical entity. 2. The blood is most frequently infected from a skin lesion. 3. Children with skin lesions should be limited in their physical activities, and toxoid should be administered. 4. Toxoid will raise the titer (antitoxin in the blood) in some cases when infection has not done so. 5. No patient should be operated on if there is not a definite abscess.—*J. Bone & Joint Surg.*, 20:35, 1938.

Frank Allen.

Calcium Metabolism and Teeth

By Isaac Schour

The author reviews briefly his work and that of others on normal calcium metabolism, and in relation to the adult tooth, the growing tooth, endocrines, vitamines, fluorosis, caries, pregnancy and pathologic calcification, and cites seventy-one references to the literature of calcification of the teeth. He emphasizes that (1) one must distinguish between growing and fully formed teeth; (2) teeth are not storehouses for calcium as is bone; (3) human teeth may serve kymographically in tooth ring analysis of calcification, and (4) calcium therapy in dentistry *per se* is not justifiable.—*J. A. M. A.*, 110:870, March 19, 1938.

Martin Deakins.

Three-Rooted Lower Molars in Man and Their Racial Distribution

By E. Tratman

Lower first and third permanent molars with a distolingual third root occur frequently in Oriental races, *i.e.*, Chinese, Eurasian, Malay and Javanese. The lower second molar very rarely (only one case) has three roots. In Chinese males, three-rooted teeth are found on the right side in 10 per cent of the cases examined, and half as frequently on the left side. The fact that the condition is more symmetrical in females indicates a sex difference. It is rare in deciduous teeth. Racial differences apparently exist, the data pointing to the greatest incidence in Chinese Teochews and Javanese. However, more cases

must be studied to make the evidence conclusive.—*Brit. D. J.*, 64:264, 1938.

MARTIN DEAKINS.

A Study of the Diet and Habits of School Children in Relation to Freedom from or Susceptibility to Dental Caries

By T. READ and E. KNOWLES

Two groups of twelve school children each, aged 3 to 14, were studied and detailed data obtained under the headings of:

	Group I	Group II
Financial circumstances	Same	
Infant feeding	Good	Unsatisfactory
Fat in diet	Adequate	Deficient
Carbohydrate in diet	Not excessive	Excessive
Protein in diet	Adequate	Deficient
Milk (additional)	All but one case	All cases average one-third pint
Fruit in diet	Daily	Very little
Vegetables	Daily	Lacking
Cod liver oil	All but three cases	Limited, and in six cases only
Sweets	Limited	Excessive
Oral hygiene	Very good	Poor
Breathing habits	All nose breathers	Six mouth breathers
Regularity of meals	Regular, no "piecing"	

Group I was entirely caries free. Group II had extensive caries. The findings given here in columns 2 and 3 are summaries of the quite extensive data. Studies on 2,894 English children from 6 to 13 years showed increasing incidence of caries up to 94 per cent at thirteen years.—*Brit. D. J.*, 64:185, 1938.

MARTIN DEAKINS.

Comparison of Lysozyme Preparations from Egg White and Cat and Human Saliva

By E. ROBERTS, B. MACGRAITH and H. FLOREY

METHODS are described for preparing lysozyme from cat and human saliva. These preparations are then compared with egg-white lysozyme. They were found to resemble each other in several chemical and physical properties, but to differ distinctly serologically. All these have the power, however, to dissolve *M. lysodeikticus*. Prolonged secretion of saliva in the cat resulted in a decrease of the lysozyme content until even pilocarpine had no further effect as a stimulant.—*Quart. J. Exper. Physiol.*, 27:381, 1938.

MARTIN DEAKINS.

New Observations on Inhibine and Mutine (of Saliva)

By H. DOLD

THE substance in the saliva which prevents the growth of diphtheria bacilli is called inhibine and that which brings about their change to pseudodiphtheria bacilli is called mutine. On the basis of physical and chemical tests, it is decided that inhibine is not the same as lysozyme and that it is not a product of bacterial antagonism. This agent is found in other body secretions, cow's milk, plant extracts, etc. Changes in virulence and other properties of organisms brought about by mutine are listed.—*Centralbl. f. Bakteriol.*, Part 1 (orig.), 140:265, 1937.

B. G. BIBBY.

A New Mouth Streptococcus

By W. BACHMANN and M. BOCK

THE authors point out that anaerobic mouth organisms have not been fully investigated, most cultures being directed toward the cultivation of specific organisms. They isolate and describe an anaerobic streptococcus which does not seem the same as those described by Prevot or Gino. They conclude that the possible pathogenic significance of anaerobic mouth streptococci should be kept in mind.—*Centralbl. f. Bakteriol.*, Part 1 (orig.), 140:86, 1937.

B. G. BIBBY.

Case of Acute Myeloid Leukemia

By EVELYN SPRAWSON

THE first sign of disease was painless swelling over the left side of the mandible. Two days later, the gums were sore and the patient felt ill. On succeeding days, the mandibular swelling increased and the bicuspid and molar became very loose. The swelling became black and all the mandibular gingival margins were grayish blue and necrotic. There was no discharge of pus. On the fifth day, a blood count revealed 17 per cent of myeloblasts and established the cause of the mouth

conditions. The patient died on the ninth day.—*Proc. Roy. Soc. Med.*, 31:398, 1938.

B. G. Bibby.

Pathogenicity of Fusobacteria in Man

By H. Dicker

An organism identified as *Fusobacterium nucleatum* (Knorr) isolated from a case of empyema was used in animal experiments. Subcutaneous abcesses were produced in guinea-pigs and rabbits, from which the organism was again isolated. Complement fixation tests showed specific antibodies in the patient and immunized rabbits. This work is asserted to be the first proof of the pathogenicity of fusiform bacilli for man.—*Centralbl. f. Bakteriol.*, Part 1 (orig.), 141:37, 1938.

B. G. Bibby.

Infection of the Salivary Glands

By R. T. Payne

The author limits himself to infectious conditions of the salivary glands and excludes virus infections such as mumps and the chronic infections of tuberculosis, syphilis and actinomycosis. One hundred and seventeen cases of parotid and ninety-one cases of submaxillary gland infection serve as the basis for the paper. Acute parotitis is frequently the result of poor oral hygiene particularly in postoperative periods when the patient is not being fed by mouth. It is generally of ascending origin, extension from adjacent organs or a hematogenous source being rare. Etiologic factors in forty-two cases are tabulated, showing dental infections and extractions and hematemesis to be most commonly associated. In this condition, inflammation occurs in the distal third of the duct and cellular desquamation and mucus secretions produce a blocking of the duct, the so-called salivary thrombus. Infection then ascends to the fine ducts and acini, and suppuration, perforation or necrosis may occur. *Staphylococcus aureus* is the most common organism, but *Streptococcus viridans* and other organisms are also involved. Clinical types and treatment are discussed. Recurrent parotitis is a well-defined clinical entity, more common in women than in men. One or both glands may be affected, periodic discomfort resulting, but rarely external signs of inflammation. Attacks are sudden or gradual and may last from a few hours to months. The saliva becomes tenacious and turbid and contains mucus, but not pus. *Streptococcus viridans* is the most common organism. The etiology is like that of acute parotitis, but is more frequently associated with local infections. The submaxillary glands show similar clinical conditions, but the acute conditions are generally associated with salivary calculi in the glands or ducts. Complications are serious. Infections of the sublingual glands are rare.—*Proc. Roy. Soc. Med.*, 31: 398, 1938.

B. G. Bibby.

BIBLIOGRAPHICAL

BOOK REVIEWS

"Alfred Owre, Dentistry's Militant Educator"

By NETTA W. WILSON. Minneapolis: The University of Minnesota Press. Price $4.

This biography of a man whom the title appropriately designates as "dentistry's militant educator" tells, in a more or less dramatic manner, the life story of Alfred Owre, one of the most unusual men in the history of dentistry. The book is issued as a memorial to Dr. Owre by his many friends and associates in his educational efforts and is an unusually frank and faithful record of the efforts, the ideals, the aspirations and hopes of an idealist in dentistry, even though in some of its phases the story is a bit colored by sentimentality.

Alfred Owre was a man of strong convictions and with the courage to fight for them under the most unfavorable conditions. And in his endeavors to impress, not to say force, his ideas of dental education upon his colleagues, he fully justified the sobriquet of "dentistry's militant educator." In fact, he was so militant and so strongly convinced of the worthiness of his cause that he not only hurt his cause, but also alienated many of his closest friends and, too, brought about his virtual isolation from those whose help was most essential to forwarding his ideals.

That Alfred Owre's life and activities exerted a definite influence on the development of dental education no one will question, but the estimates of the influence of his educational endeavors vary almost in direct proportion to the admiration of and adherence to the principles of Owre by the estimator.

He was an advocate of socialization of medicine and his views in this respect were said to be fifty years ahead of his time. Any one who knew Dr. Owre well would know that they were born of an honest conviction, the result of many years of thought and experience in the dental educational field.

The book is written in a most interesting narrative style and sheds many illuminating sidelights on the events of recent years that have determined the direction of development of dentistry as an autonomous profession.

Every one interested in the historical aspects of the dental educational movement in America should read the life story of Alfred Owre.

"Workbook in Elementary Diagnosis for Teaching Clinical History Recording and Physical Diagnosis"

By LOGAN CLENDENING, Professor of Clinical Medicine, University of Kansas. St. Louis: The C. V. Mosby Co., 1938. Price $1.50.

This is a student's guide to conducting physical examination and recording the clinical history with a view to diagnosis. The methods of procedure in examining the patient with the method of recording the findings are particularly recommended by the author together with an elaboration of the desirability and the advantage of the individual record. Careful examination is a most necessary aid to diagnosis and this book explains in detail each step of an intelligently directed physical examination.

"Food Values of Portions Commonly Served"

Compiled by ANNA DE PLANTER BOWES, M.A., Director, Nutrition Education, Philadelphia Child Health Society; Instructor in Nutrition Schools of Education and Dentistry, University of Pennsylvania; and CHARLES F. CHURCH, M.D., M.S., Associate in Pediatrics, School of Medicine, University of Pennsylvania; Director of Research Rockefeller Nutrition Fund, Children's Hospital of Philadelphia. Price 50 cents.

The authors affirm as the purpose of this book an effort to supply authoritative data on the nutritional values of foods in a form for quick and easy reference. It is compiled primarily for use by students in the dental and medical schools of the University of Pennsylvania as a guide in evaluating diets.

As a ready reference guide in estimating the dietetic value of practically all foods and all classes of foods, this little booklet will certainly prove itself of inestimable value to student and practitioner alike. There is in it an elaborate and clearly printed chart of foods classified as to character and quantities usually consumed, showing the weights in grams and translated into the everyday kitchen measure equivalents; the number of grams of protein, fat and carbohydrate; the number of calories; the amount of calcium, phosphorus and iron, and the vitamin character and content of the average food portions. This little book can be very helpful, not only to students and to dietitians, but also to the individual in determining that most desirable dietary aim —a balanced diet—as far as the general bodily needs are concerned.

"Surgical Anatomy of the Head and Neck"

By JOHN FINCH BARNHILL, M.D., F.A.C.S., LL.D. Formerly Professor of Otolaryngology in the Indiana University School of Medicine; Emeritus Professor of Surgery of the Head and Neck; Formerly Chief of the Department of Head and Neck Surgery in the Indiana University Hospitals; Honorary Professor of Anatomy, University of Southern California School of Medicine. Baltimore: William Wood & Company, 1937. With 431 hand drawn illustrations, some of them colored. Price $20.

This book inaugurates somewhat of a departure in style and content from the regulation textbook of anatomy. Its approach is that of the laboratory manual method of teaching from the dissection table, but supplemented by descriptions and discussions of numerous diseases of the head and neck from the standpoints of diagnosis and treatment. In this feature, the author includes an analytic consideration of the anatomy of the parts and structures as related to disease and treatment. As a specific example of this valuable feature of the book, the author studies the musculature and bony structures of the jaws with relation to frequency of fracture and the methods of setting fractures suggested by the anatomy of the parts. Another example of the unique method of treatment of the subject is the author's comments on the Caldwell-Luc operation as being destructive to the vitality of the pulps of teeth because of surgical interference with the nerve supply of the teeth.

He devotes much attention to the impacted, unerupted or embedded third molar, including a report of a study of 700 cases by C. B. Henry, of London, in which it is somewhat astounding to note that there were forty fatalities. The author notes that this high mortality rate is surprising, but uses the figures to emphasize the importance of scrupulous care in examination of the mouth when the cause of the conditions is not readily discernible and it may have a dental source.

There are 431 drawings illustrating the structures of the head and neck, with many excellent illustrations of the tissues and structures of the mouth.

The section on anesthesia is particularly timely as it deals quite fully with the familiarity with anatomy necessary in making the various injections for producing local anesthesia.

On the whole, this book constitutes an excellent and accurate guide to the anatomy of the mouth and one that will be most helpful to the dental student.

"Synopsis of Digestive Diseases"

By JOHN L. KANTOR, Ph.D., M.D., Associate in Medicine, Columbia University; Gastroenterologist and Associate Roentgenologist, Montefiore Hospital for Chronic Diseases, New York. St. Louis: The C. V. Mosby Company, 1937. Price $3.50.

A ready reference book, not too bulky for the pocket (small octavo, 300 pages), this is a suitable book companion of the practitioner. It synopsizes rather fully the more frequent diseases of digestion, with definite suggestions as to methods and procedures of diagnosis. It gives the etiology, pathology, symptoms, diagnosis and treatment of digestive diseases in a brief reference form that should be helpful as a reminder to the general practitioner.

There is included a chapter on diseases of the mouth, but mouth diseases are treated here in a very generalized manner with particular reference only to xerostomia, glossodynia and sialorrhea.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

American Dental Association, St. Louis, Mo., October 24-28.

American Academy of Restorative Dentistry, St. Louis, Mo., October 22-23.

American Society for the Advancement of General Anesthesia in Dentistry, New York City, fourth Monday in March and October.

American Society of Orthodontists, Los Angeles, Calif., July 11-14.

Fédération Dentaire Internationale, Paris, July 21-26.

Great Lakes Association of Orthodontists, Cleveland, Ohio, November 7-8.

Pacific Coast Dental Conference, Vancouver, B. C., July 4-8.

Greater New York Dental Meeting, New York City, December 5-9.

District of Columbia Dental Society, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

American Dental Society of Europe, Stockholm, August 1-3.

Baltimore College of Dental Surgery Alumni, Baltimore, Md., June 1-4.

Temple University Dental School Alumni, Philadelphia, Pa., May 25-27.

Montreal Dental Club Clinic, at Montreal, Canada, October 12-14.

Ontario Dental Association, Toronto, May 16-18.

Association of French-Speaking Dentists of North America, Montreal, Canada, June 2-5.

ARPA Internationale, Prague, Czechoslovakia, August 26-28.

American Dental Hygienists' Association, St. Louis, Mo., October 24-28.

American Dental Assistants Association, St. Louis, Mo., October 24-28.

Dental Hygienists Association of the State of New York, Syracuse, May 11-13.

STATE SOCIETIES

May

Arkansas, at Little Rock (16-18)
Connecticut, at New Haven (4-6)
Georgia, at Macon (16-18)
Illinois, at Peoria (10-12)
Indiana, at Indianapolis (16-18)
Iowa, at Davenport (3-5)
Maryland, at Baltimore (2-3)
Missouri, at Columbia (8-9)
Montana, at Helena (5-7)
Nebraska, at Lincoln (16)
New York, at Syracuse (10-13)
North Carolina, at Winston-Salem (2-4)
North Dakota, at Minot (16-18)
Pennsylvania, at Philadelphia (3-5)
South Dakota, at Watertown (23-24)
Tennessee, at Chattanooga (9-12)
Vermont, at Rutland (18-19)
West Virginia, at Wheeling (16-18)

June

Colorado, at Estes Park (20-22)
Maine, at Portland (27-28)
Nevada, at Reno (4)
New Hampshire, at North Conway (6-7)
New Mexico, at Carlsbad
South Carolina, at Columbia (13-14)

November

Ohio, at Cleveland
Florida, at Jacksonville (10-12)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 20. James A. Blue, Comer Bldg., Birmingham, Secretary.

Arkansas, at Little Rock, June 20-24. Clarence W. Koch, 817 Donaghey Building, Little Rock, Secretary.

Arizona, July 18. R. A. McCall, 719 Professional Bldg., Phoenix, Secretary.

California, at San Francisco, May 23; at Los Angeles, June 20. Kenneth I. Nesbitt, 450 McAllister St., San Francisco, Secretary.

Colorado, at Denver, June 21-25. David J. Tepley, 807 Republic Bldg., Denver, Secretary.

Connecticut, at Hartford, June 21-25. Al-

mond J. Cutting, Southington, Recorder.

Delaware, at Wilmington, July 6-8. Charles R. Jefferis, 409 Medical Arts Bldg., Wilmington, Secretary.

Florida, at Jacksonville, June 20. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Georgia, at Atlanta, June 6. R. C. Coleman, Secretary.

Idaho, August 2-5. J. L. Balderston, Boise, Commissioner.

Illinois, at Chicago, June 14-17. E. F. Hazell, Springfield, Secretary.

Indiana, at Indianapolis, June 14. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Iowa City, May 30-June 3. Hardy F. Pool, Mason City, Secretary.

Kentucky, June 14-17. Robert L. Sprau, 970 Baxter Ave., Louisville, Secretary.

Louisiana, at New Orleans, June 14-18. Joseph L. Webre, Audubon Bldg., New Orleans, Secretary.

Maine, at Augusta, June 23-25. Fred B. Wheaton, 319 Main St., Biddeford, Secretary.

Maryland, May 25-27. T. L. McCarrier, 827 N. Charles St., Baltimore, Secretary.

Michigan, at Ann Arbor, June. Charles J. Marcinkiewicz, 672 Fisher Bldg., Detroit, Secretary.

Minnesota, at Minneapolis, June 17-23. Paul Hagen, Crookston, Secretary.

Mississippi, at Jackson, June 21. A. B. Kelly, Yazoo City, Secretary.

Missouri, at Kansas City, June 6-11; at St. Louis, June 8-11. R. R. Rhodes, Jefferson City, Secretary.

Montana, at Helena, July 11. Leonard A. Jenkin, 401 Ford Bldg., Great Falls, Secretary.

Nebraska, at Omaha and Lincoln, June 13-18. Mrs. Clark Perkins, Lincoln, Director.

Nevada, at Reno, June 6. G. C. Steinmiller, Box 274, Reno, Secretary.

New Hampshire, at Manchester, June 27-29. Otis M. Littlefield, Manchester, Secretary.

New Jersey, June 27-July 2. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

New Mexico, at Albuquerque, June 20-24. J. J. Clarke, Artesia, Secretary.

New York, June 27-30; September 19-22. Minor J. Terry, Education Bldg., Albany, Secretary.

North Carolina, at Raleigh, June 27. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 11-14. W. E. Cole, Bismarck, Secretary.

Ohio, at Columbus, June 27. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 22-25. W. T. Longwell, Frederick, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 14-18. W. A. McCready, 1115 Highland Bldg., Pittsburgh, Secretary.

Rhode Island, at Providence, June 28-30. Robert D. Wholey, State Office Bldg., Providence, Chief.

South Carolina, at Columbia, June 9-11. T. C. Sparks, 1508 Washington St., Columbia, Secretary.

South Dakota, at Sioux Falls, June 28-30. H. W. Thomas, Aberdeen, Secretary.

Tennessee, at Memphis, June 13. B. C. Gallimore, Commercial Bank Bldg., McKenzie, Secretary.

Texas, at Houston, June 21-25. B. Carl Holder, Nixon Bldg., Corpus Christi, Secretary.

Utah, at Salt Lake City, June 13-16. Barlow Fox, First National Bank Bldg., Salt Lake City, Secretary.

Vermont, Montpelier, June 27-29. H. B. Small, Burlington, Secretary.

Virginia, at Richmond, June 14. John M. Hughes, 715 Medical Arts Bldg., Richmond.

West Virginia, at Charleston, June 27. Henry C. Hill, Dominion Bldg., Charleston, Secretary.

Wisconsin, at Milwaukee, June 20-24. S. F. Donovan, Tomah, Secretary.

Wyoming, at Cheyenne, June 27-29. P. M. Cunningham, Cheyenne, Secretary.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

The next examinations by the Delaware State Board of Dental Examiners for license to practice dentistry and dental hygiene will be held in Wilmington, July 6-8. Applications must be in the hands of the secretary at least thirty days prior to the date of the examinations.

CHARLES R. JEFFERIS, *Secretary,*
409 Medical Arts Bldg.,
Wilmington.

GEORGIA STATE BOARD OF DENTAL EXAMINERS

The Georgia State Board of Dental Ex-

aminers will hold its annual meeting for the purpose of examining applicants to obtain a license to practice dentistry in this state June 6, at the state capitol, Atlanta.

R. C. COLEMAN, *Joint Secretary,*
State Examining Boards.

STATE OF NEBRASKA DENTAL EXAMINING BOARD

The next dental examination of the Bureau of Examining Boards of the State of Nebraska will be given June 13-18. The first three days' examination (practical) will be given at the University College of Dentistry, Lincoln, and at the Creighton College of Dentistry, Omaha. The last three days' examination (written) will be given at the state capitol, Lincoln. All applications should be on file at least fifteen days prior to the date of the examination.

MRS. CLARK PERKINS, *Director,*
Bureau of Examining Boards,
Lincoln.

NEW MEXICO BOARD OF DENTAL EXAMINERS

The next meeting of the New Mexico Board of Dental Examiners will be held at Albuquerque, June 20-24. Address all communications to

J. J. CLARKE, SR., *Secretary,*
Artesia.

OKLAHOMA BOARD OF DENTAL EXAMINERS

The next examination of the Oklahoma Board of Dental Examiners will be held in Oklahoma City, June 22-25. For applications and information, address

W. T. LONGWELL, *Secretary,*
Frederick.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

The South Carolina State Board of Dental Examiners will hold its next annual meeting June 9-11, in Columbia.

T. C. SPARKS, *Secretary,*
1508 Washington St.,
Columbia.

STATE OF VERMONT BOARD OF DENTAL EXAMINERS

The Vermont State Board of Dental Examiners will meet June 27-29 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, accompanied by the examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. For application blanks and other information, address

H. B. SMALL, *Secretary,*
Burlington.

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

The next regular meeting of the Virginia State Board of Dental Examiners will be held at the Medical College of Virginia, Richmond, June 14. Applicants are required to present a certificate from the Virginia State Board of Education showing that they have had one year of academic education equal to one year of college work, must be graduates of Class A or B dental college or university and must be prepared to do any kind of practical or operative work necessary in the general practice of dentistry. Theoretical examination covers subjects usually found in a complete dental curriculum. Applications, with fee and photograph, must be filed, complete, fifteen days before the examination (June 14). For application blanks and further information, apply to

JOHN M. HUGHES, *Secretary,*
715 Medical Arts Bldg.,
Richmond.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

The American Academy of Restorative Dentistry will meet in the Ivory Room of the Hotel Jefferson, St. Louis, Mo., October 22-23.

A. F. SCHOPPER, *Secretary,*
Professional Bldg.,
Kansas City, Mo.

GREATER NEW YORK DENTAL MEETING

The Fourteenth Greater New York Dental Meeting will be held December 5-9 at the Hotel Pennsylvania, New York City.

GEORGE C. DOUGLASS,
Room 106A,
Hotel Pennsylvania,
New York City.

CLEVELAND CLINIC

The Cleveland Clinic Foundation offers a one year fellowship, beginning July 1, in the

dental division, which includes radiography, diagnosis, consultations and minor oral surgery, with an opportunity to study dental relationship to general chronic disease conditions. Applicants must be registered in Ohio. For an application, write to A. T. Bunts, M.D., chairman of the Fellowship Board, 2020 East Ninety-Third St., Cleveland, Ohio.

CHARLES A. RESCH,
Department of Dentistry.

ONTARIO DENTAL ASSOCIATION

The seventy-first annual convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May 16-18. Dentists from the United States and from all parts of Canada will be welcomed as guests.

FÉDÉRATION DENTAIRE INTERNATIONALE

The next meeting of the Fédération Dentaire Internationale will be held in Paris, July 21-26.

W. H. G. LOGAN, *President,*
55 East Washington St.,
Chicago, Ill.

NEW ENGLAND HEALTH EDUCATION ASSOCIATION

The thirteenth annual conference of the New England Health Education Association will be held June 3-4 at the Pratt Building of Naval Architecture, Cambridge, Mass.

MARION R. KANTER, *Publicity Chairman,*
Ralph Waldo Emerson School,
Roxbury, Mass.

POSTGRADUATE COURSES AT THE UNIVERSITY OF PENNSYLVANIA

The School of Dentistry of the University of Pennsylvania announces that it will hold two postgraduate courses: (1) in dental prosthesis and (2) in oral surgery, exodontia and anesthesia, each to extend from May 23 to June 8. Classes will be limited to twelve in each subject. The courses immediately precede the Alumni Day activities of the university.

ROBERT H. IVY, *Chairman,*
Faculty Committee on
Graduate Instruction,
40th and Spruce Sts.,
Philadelphia, Pa.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING MARCH 1938

March 8

No. 2,110,301, to EMERY J. LAPORTE. Casting apparatus.

No. 2,110,315, to EDWARD WOLFSON. Dental appliance.

No. 2,110,339, to ALPHONSE F. PIEPER. Fluid control device.

No. 2,110,461, to ELHANAN S. CHIBNIK. Toothbrush.

No. 2,110,826, to DAVID CURTIS. Anesthetic solutions and mixtures for preparing same.

March 15

No. 2,110,860, to KARL F. GREMPLER. Temperature conditioning plate.

No. 2,111,095, to DAVID E. EVANS. Carding device for interchangeable artificial teeth.

No. 2,111,181, to LEGER L. FINDLEY. Toothpaste compact.

No. 2,111,238, to WILLIAM H. DOYLE. Toothbrush.

No. 2,111,276, to JAMES B. CASTNER and WILLIAM E. KIRST. Process for production of nitrous oxide.

No. 2,108,852, to GEORGE LESLIE HERRICK, JOSEPH P. HARDIE and ARTHUR COBB, JR. Design for toothbrush.

March 22

No. 2,111,645, to WILLIAM SLUTZKY and ROBERT W. SLUTZKY. Electrothermic fountain spatula with interchangeable dental attachments.

No. 2,111,787, to CALVIN W. KNOWLES. Dental bridge and method of making same.

No. 2,111,876, to NELSON SWENSON. Toothbrush.

No. 2,111,880, to WILLIAM E. WATERS. Toothbrush.

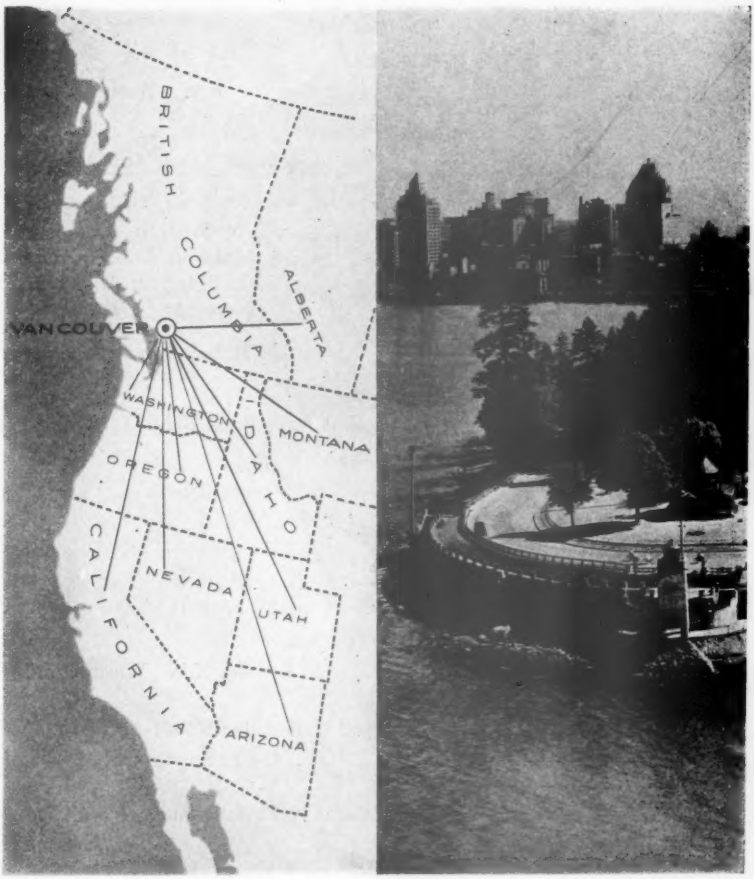
No. 2,112,007, to PICKNEY B. ADAMS. Anchoring means for false teeth.

No. 2,112,184, to JOHN W. VOGAN. Double pressure interdental wedge gum massager.

March 29

No. 2,112,713, to MORRIS SEIFMAN. Porcelain-faced dentoid structure.

Fifth Pacific Coast Dental Conference



View from the air of Vancouver, British Columbia, host city to the Pacific Coast Dental Conference, July 4-8.

The unusual vacational attractions of British Columbia and the Canadian Rockies, where some of the finest hotels on the continent are situated, will undoubtedly increase the attendance at this meeting.

Members in good standing in the American Dental Association may register as associate members.

W. J. Lea, D.D.S., *President*,
1520 Medical-Dental Bldg.,
Vancouver, B. C.

W. S. Watson, D.D.S., *Secretary*,
304 Birk's Bldg.,
Vancouver, B. C.

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1937-1938

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